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PAGE 44

## HAIR & FUR IN HOUDINI
Discover all that there is to know about the extensive new toolset

## 30 TEXTURE SECRETS
Learn the dark arts of texture from a huge panel of artists

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Jahirul Amin gets technical with his posing guide

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## Model & texture a Centurion page 44

These soldiers had to endure harsh weather and countless attacks. Some well-placed damage can add a lot of appeal and realism to a character

**Damon Woods** reveals his knack for accurate CG in his incredible tutorial **Page 44**



**Damon Woods**
**dkwoods.artstation.com**

**Software** ZBrush, 3ds Max, Marvelous Designer, KeyShot

Your next car will be 3D printed **Page 34**

# Welcome

## To the magazine and 100 pages of amazing 3D

Welcome to **3D Artist**! I'm very excited this month. As a bit of a history buff, the prospect of putting a Roman centurion on the cover of the mag was impossible to resist! I made the right decision, though, as you can probably ascertain from the astounding quality that ZBrush pro Damon Woods has achieved with his creation, and you can find out all about how he did it in his excellent tutorial over on p44.

Following last issue's exploratory foray into 3D printing, we've continued on our journey of discovery by talking to the people that are making car manufacturing using 3D printing a reality. We're not talking nuts and bolts – we're talking entire chassis, as evidenced by the image above. 3D printing is accelerating, and we're holding on for dear life while bringing you the best coverage around.

Elsewhere in the magazine, we've pulled together an unbelievable panel of industry experts from companies like Blur Studio, MPC and ILM to bring you their texturing secrets on p24, and as well as Damon's aforementioned historical creation we've compiled a huge Pipeline section comprising of 42 pages of tutorials and advice. If you're looking to learn from the best, you've come to the right place! Enjoy the issue.

**Steve Holmes,** Deputy Editor

Sign up, share your art and chat to other artists at **www.3dartistonline.com**

**Get in touch...** 3dartist@imagine-publishing.co.uk @3DArtist Facebook.com/3DArtistMagazine


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# The Expert Panel

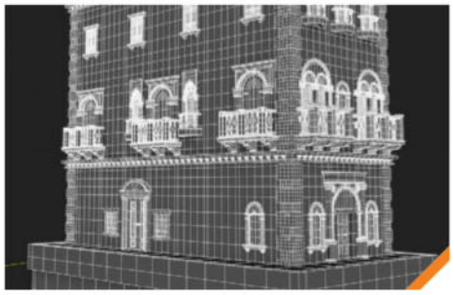
## This issue's team of pro artists...

### DAMON WOODS
**dkwoods.artstation.com**

If you fancy re-creating our incredible cover image, head to p44 where Damon reveals his incredible ZBrush, 3ds Max, Marvelous Designer and KeyShot character workflow.
**3DArtist online username** DK Woods

### CARLOS ORTEGA ELIZALDE
**carlosortega.prosite.com**

Carlos has such a wonderful, recognisable style that we felt compelled to ask him to put together a tutorial for us. Find out how he made a convincing cartoon character in Maya on p58.
**3DArtist online username** carlosortega3d



### GEORG-SEBASTIAN DRESSLER
**morroimages.com**

Morro Images is currently developing a full-length animated film called *Serena & The Enchanted Island*. Learn how the team re-created a classic Venetian building in a cartoon style on p52.
**3DArtist online username** n/a

### JAHIRUL AMIN
**jahirulamin.com**

Jahirul has legitimately provided us with more videos, scene files and images than we know what to do with this month! You can download them from **FileSilo.co.uk**, but in the meantime, head to p66.
**3DArtist online username** n/a

### RAINER DUDA
**rainer-d.eu**

The technical director and Clarisse IFX expert is back to show off the latest grooming tools included in Houdini 14. If you want to improve your hair and fur simulations, check out p70.
**3DArtist online username** Rainerd

### JOEY CAMACHO
**rawandrendered.com**

Learn all about how to create incredible abstract particle renders using Cinema 4D, X-Particles and OctaneRender in Joey's hugely detailed tutorial. It runs across four pages and begins on p74.
**3DArtist online username** n/a

### JAMES CLARKE
**twitter.com/jasclarkewriter**

James had a chat with Animatrik this month, learning all about how the studio used mo-cap to produce digital doubles for Clint Eastwood's much vaunted *American Sniper*. It's on p90.
**3DArtist online username** n/a

### CHRIS MCMAHON
**linkedin.com/in/chrismcmahoneditor**

Former **3D Artist** editor Chris speaks to Jaideep Arun Khadilkar from DreamWorks Animation about his time in the industry working in FX development over on p92.
**3DArtist online username** n/a

### ORESTIS BASTOUNIS
**twitter.com/mrbastounis**

Orestis sent us an email after spending some time with the new PNY Nvidia M6000 this month, signing off with "I want one". He's also cast a keen eye over a machine from Workstation Specialists.
**3DArtist online username** n/a

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## 30 Texture secrets

"A quality UV layout is vital for establishing a rock-solid texture for your 3D model"

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Model and texture a Roman Centurion

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Modular background buildings in Maya (Part 1)

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**42 PAGE PIPELINE SPECIAL**


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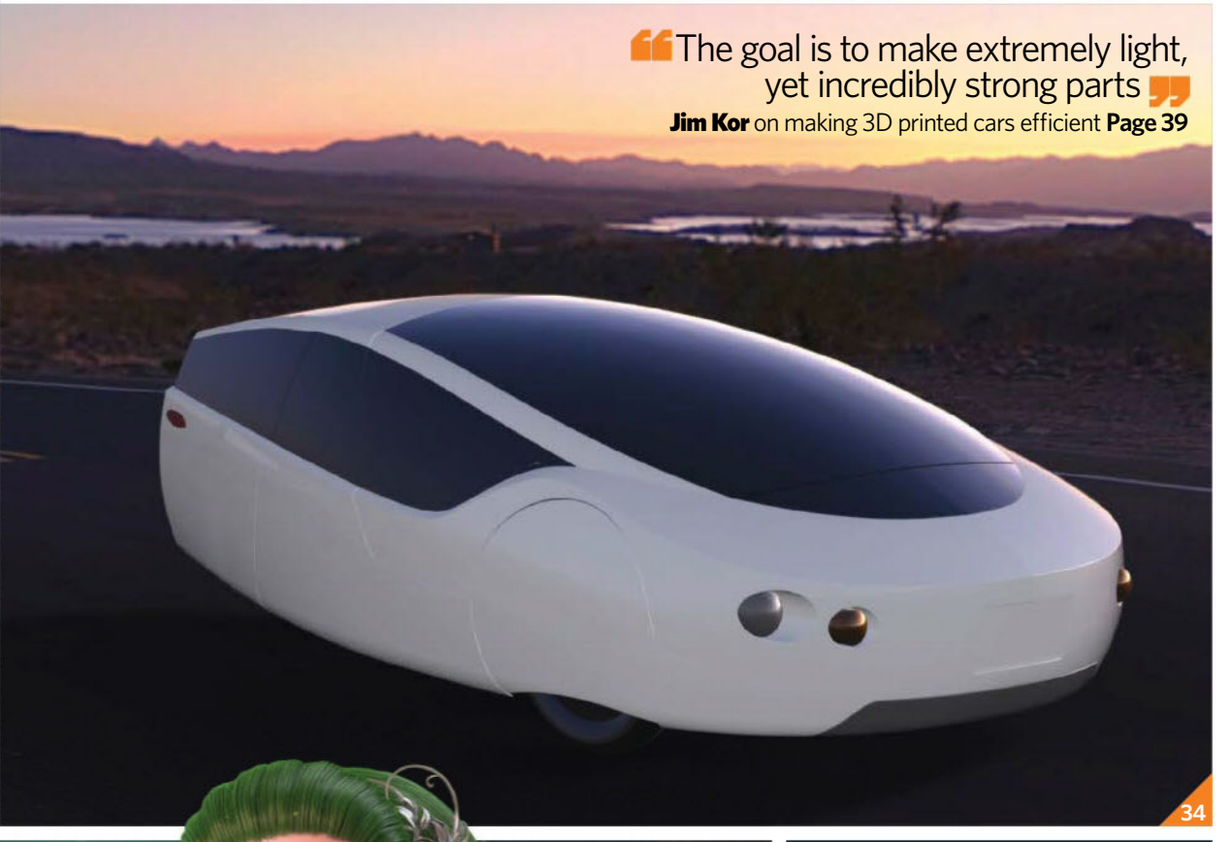


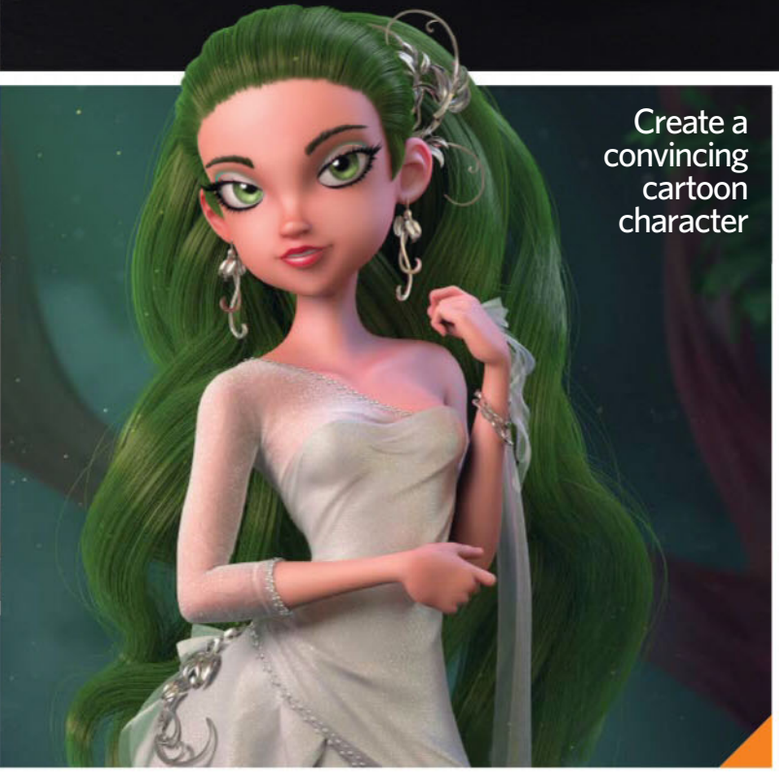


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# Join our 3DArtist Reader Panel today!

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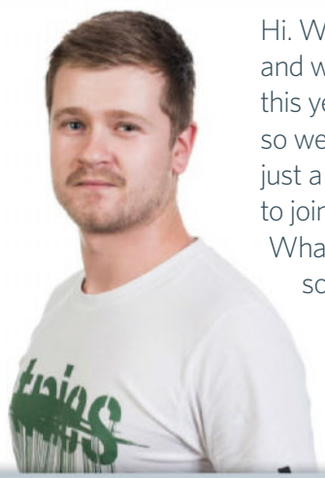

Hi. We absolutely love making 3D Artist and we hope you love reading it too. But this year we want to make it even better, so we're asking for your help. By answering just a few questions, you could be selected to join our first ever 3D Artist panel.

Whatever your skill level or discipline, I'm so excited to hear what you have to say about our CG coverage and can't wait to learn more about you.

**Steve Holmes**
Deputy Editor

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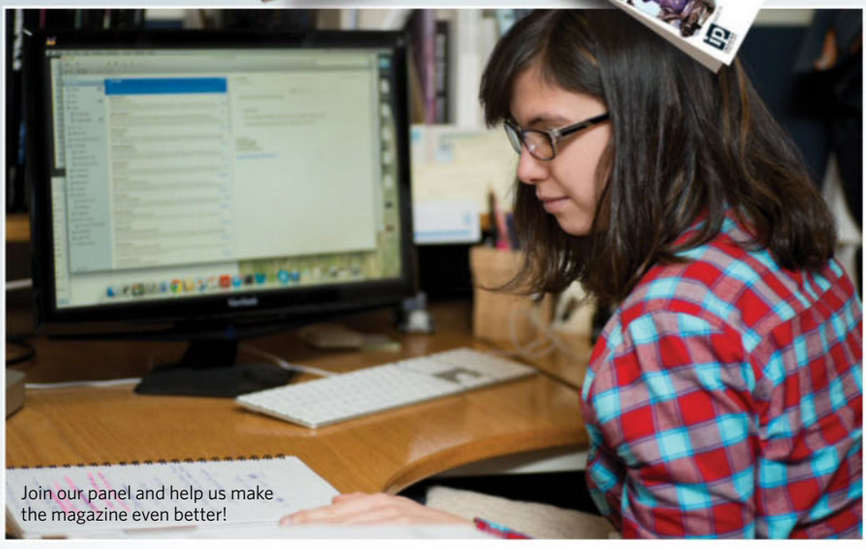

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# The Gallery

**Have an image you feel passionate about? Get your artwork featured in these pages**
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**Manuel Armonio**
**waterproofstudios.com**

Manuel is currently a 3D modeller and texture artist at Waterproof Studios

**Software** Maya, Arnold, MARI, NUKE

**Work in progress...**

"It was a challenge to work through the organic process of designing and modelling. The texturing and surfacing was done by Bo Kwon. Additionally the project was lit by Max Wahyudi and composited by Winston Fan"

**Manuel Armonio,** *Praxis 17,* 2015

**Salvo Brullo**
**nucleus-3d.com**

Salvo's love for computers led him to web design. He has since transitioned to 3D

**Software** 3ds Max, V-Ray, Photoshop

**Work in progress...**



"This piece was originally developed for a speed-modelling contest. All parts are modelled with poly modelling techniques, except the drawing on the rotary"

**Salvo Brullo,** *Classic Phone,* 2014/2015

“My goal was to make the character come alive with just a clay render. I chose certain features and expressions from my references for the look I had in mind”

**Sandeep.V.S,** *The Boxer,* 2015



**Sandeep.V.S**
**sandeepvs.cgsociety.org**

**3DArtistOnline username:**
sandeep vs

**Software** Maya, ZBrush, Arnold, Marvelous Designer, Photoshop

**Work in progress...**

> My aim with this piece was to create a huge kind of vehicle or transporter complex made out of different types of mechanical or hi-tech structures

**Markus Vogt,** *ATX-24 | The Passengers,* 2014



**Markus Vogt**
**markusvogt.eu**

Since 2003, digital artist Markus has been creating sci-fi and dark art imagery

**Software** Cinema 4D, Bryce, Photoshop

**Work in progress...**

"I was inspired by photos depicting wars in Central Africa where young men rely on modern weapons and traditional amulets. It gave me the idea of a young warrior from an imaginary future"

**Alexey Vasilyev,** *Rebel,* 2014



**Alexey Vasilyev**
**vasilyevalexey.com**

Ukraine-born Alexey studies at Canada's Think Tank Training Centre – this is his final project

**Software** Maya, ZBrush, MARI, V-Ray, Photoshop, UVLayout, TopoGun

**Work in progress...**

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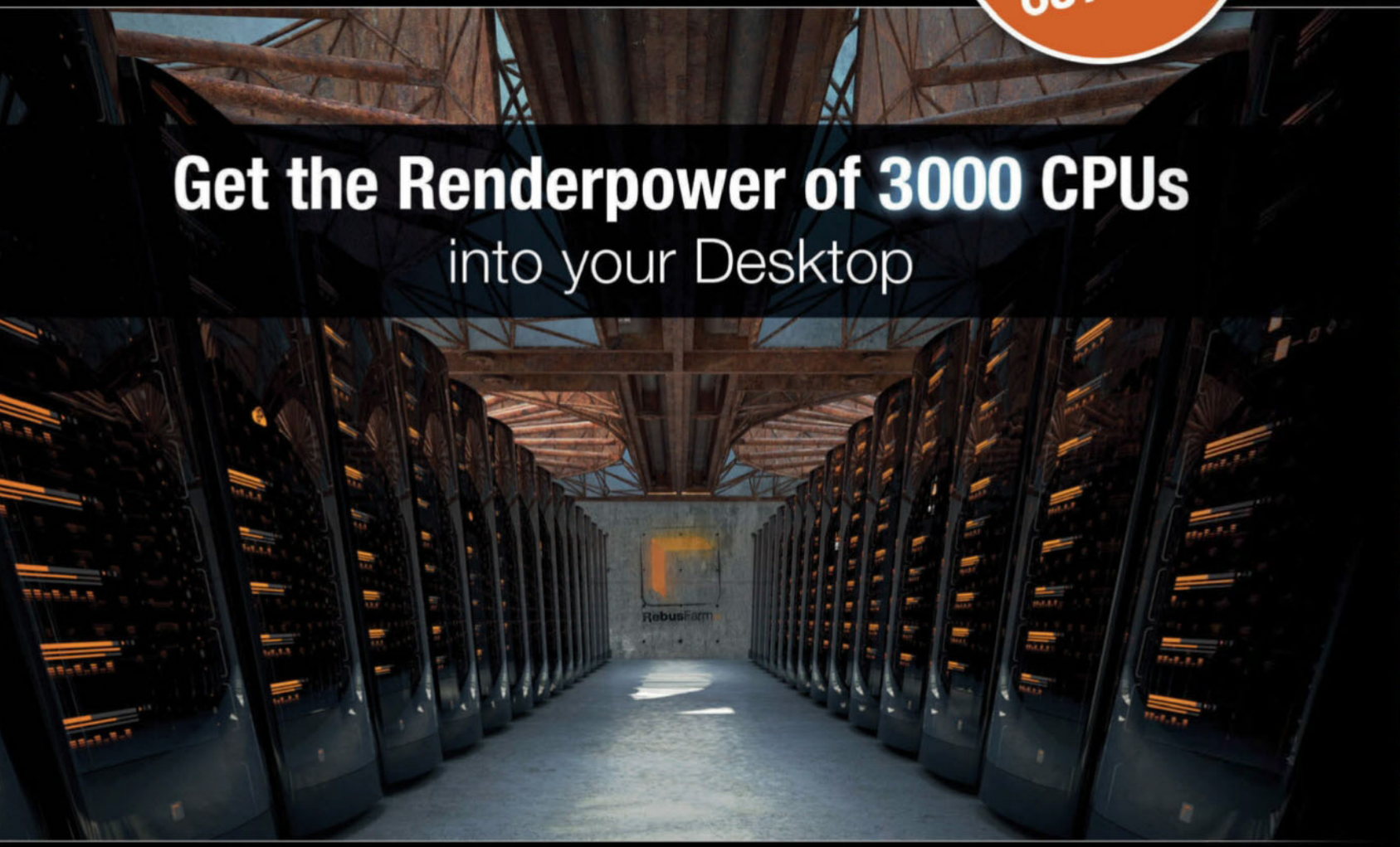


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**42 PAGE PIPELINE SPECIAL**

"I'm always inspired by sci-fi stuff. For this piece, I used some parts that I have purchased from Vitaly Bulgarov for kitbashing, and all materials were rendered in KeyShot"

**Felipe Pesantez,** *Alien Ritual,* 2015

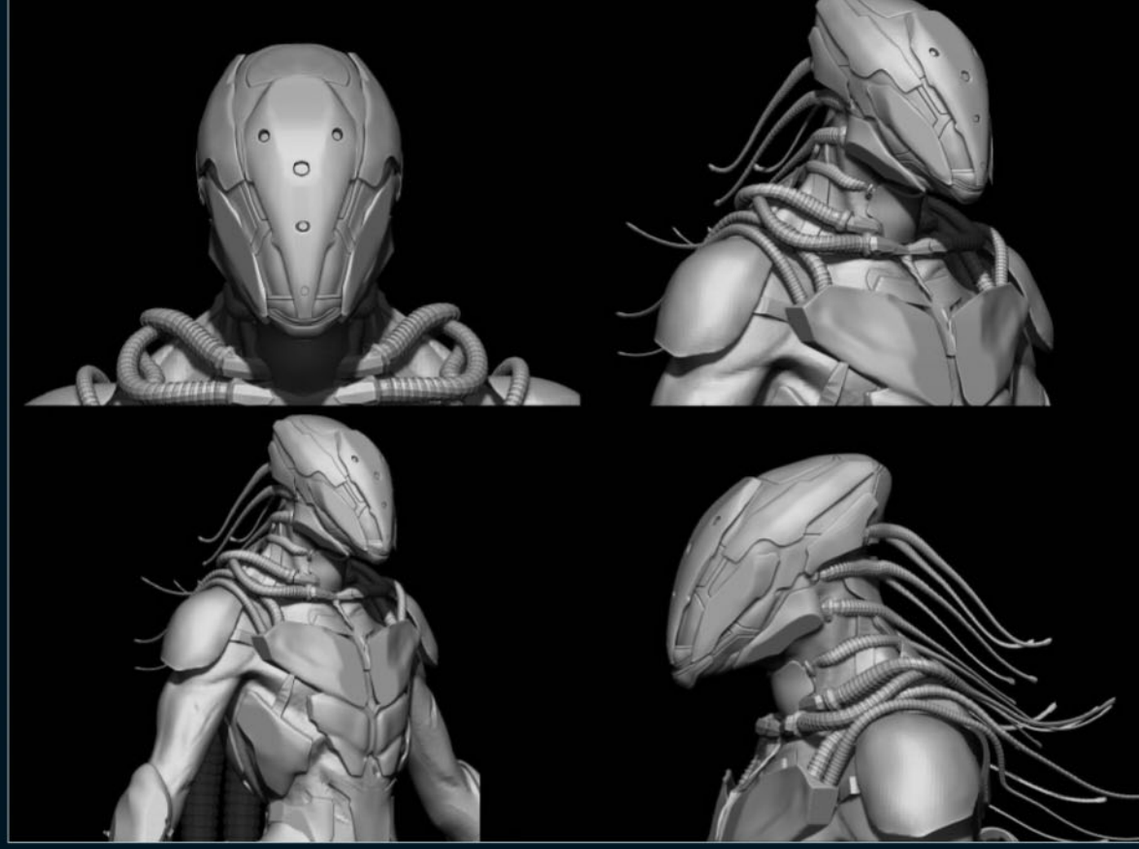


**Felipe Pesantez**
**fpesantez.deviantart.com**

**3DArtistOnline username**
fpesantez

**Software** ZBrush, 3ds Max, KeyShot, Photoshop

**Work in progress...**

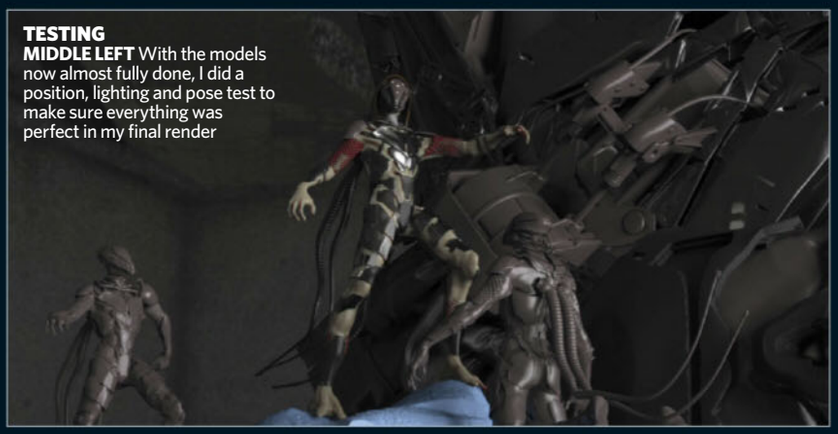


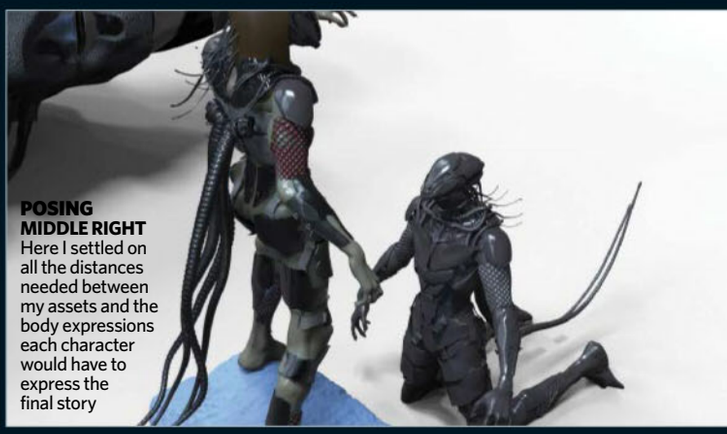
> I did a position, lighting and pose test as well as spending time on perfecting the body expressions to make sure my final piece was perfect

**Felipe Pesantez,** *Alien Ritual,* 2015

**HELMET**
**RIGHT** The helmet design was created with the use of panel loops and extractions

**TESTING**
**MIDDLE LEFT** With the models now almost fully done, I did a position, lighting and pose test to make sure everything was perfect in my final render





**POSING**
**MIDDLE RIGHT** Here I settled on all the distances needed between my assets and the body expressions each character would have to express the final story

**LIGHTING**
**BELOW** Here I have created my lighting setup for postproduction

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# 30 TEXTURE SECRETS

## Discover how to create amazing materials for games, films and more with these secrets from the industry

Of all the elements of the pipeline needed to make a piece of CG work look great, texturing is certainly one of the most important. Properly created and applied materials can make the difference between final pieces of work looking completely hyperrealistic or totally fake. They can turn the simplest chunks of geometry into realistic props made out of metal or glass, provide the perfect subsurface scattering and refraction required to replicate everything from human skin to a black hole, or bring a cartoon character to life with colour for the very first time. Without them, almost every professional quality asset in the whole computer graphics industry would remain incomplete.

Unfortunately, texturing is also one of the trickiest processes to get right. Every single person, animal and object we interact with every day is completely unique; with flaws, peculiarities and signs of ageing and use that our eyes will automatically recognise. Textures and shaders are what help get all these tiny, seemingly insignificant details to look correct to us in 3D – and sometimes, hundreds of thousands are used in a single scene to achieve the prefect results. For professional texture artists working in the games, VFX and animation industries, all this is just a part of everyday life.

To learn exactly how these amazing artists do it, we've asked 18 incredible industry experts from MPC, ILM, Method Studios, Blur, Sony Picture Imageworks, Epic Games and more to share the texturing secrets they've discovered after years of experience in the field. So what are you waiting for? Read on to take your CG work to the next level today!

## THE EXPERTS

**Myriam Catrin**
heritagecharlie.typepad.com
Senior texture artist at MPC

**Digital Tutors**
digitaltutors.com

**Alexey Fanta**
artstation.com/artist/alexfanta
Prop and texture artist

**Nicolas Garilhe**
guedin.wix.com/guedin
Freelance character artist

**Justin Holt**
justinmichaelholt.com
Texture painter supervisor at Sony Pictures Imageworks

**Arda Koyuncu**
ardakoyuncu.com
Lead character artist at Blur Studio

**Joshua Marlow**
joshmarlow.artstation.com
Environment artist at Epic Games

**Reynante Martinez**
www.reynantemartinez.com
Freelance 3D artist, art director and trainer

**Jung Won Park**
jwillust.com
3D character artist at NCSOFT

**Armando Savoia**
armandosavoia.it
Art director, concept and set designer

**Ian Spriggs**
ianspriggs.com
3D artist

**Kent Trammell**
cgcookie.com
Texturing guru and Blender expert at CGCookie

**Martin Teichmann**
martinteichmann.com
Environment artist at Rocksteady Studios Ltd

**Germano Viera**
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3D artist and freelancer

**Arvin Villapando**
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3D modelling and rendering instructor

**Wu Ling**
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3D artist

**Mark Young**
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Senior texture artist at Industrial Light & Magic

*Orphan and the Jeweller* by Wu Ling

# THEORY

**01 Prioritise working the simple approach first** Texturing can get complicated fast, I will always work with the most simple approach first and take one step at a time. While working with Specular, instead of doing both my Spec and Gloss maps at the same time I will set my Spec levels at around .5 then work on getting my Gloss settings to look good, then after I will adjust my Specular levels. This will make it easier to be able to see exactly what your Specular is doing. Always render out your Specular pass separately to check over it all. **Ian Spriggs**

**02 Use references!** That's my favourite part: I love the research! First, it gives you ideas that you wouldn't have had in the first place. Secondly, it's a great way to build an efficient library that you will use as reference but also material to paint through (this is the tool I use the most in MARI) for the colour, and for generating the Alpha or Displacement maps. Everything can be useful. The internet is such a great library that it's hard not to find what you need as materials are royalty free, but I eventually also started to take my own photos and now I'm using mainly those. **Myriam Catrin**

**03 ...And don't go straight for the obvious references** Even if it's for a specific creature like a lizard or a snake, I will look for scales of course, but then also other natural references. I'll mix these natural references with the main one in MARI to create differences, break-ups and a richer colour. **Myriam Catrin**

**04 Share your knowledge** Throughout my career I have met essentially two types of artists: those who share their knowledge, and those who don't. For some reason these artists who are reluctant to share their workflow have this idea that it is the tools that make for great texture work – if someone else learned these techniques and discovered these tools they will inherently produce great, if not better, textures. In my opinion it has almost nothing to do with the tools and virtually everything to do with the actual artist. You either have an eye for detail or you don't, and no amount of knowledge with tools and techniques will help that. Be open and share your knowledge. Have fun with helping others because those who can make it in this business of texture painting and share their knowledge will discover it to be a two-way street. **Justin Holt**

**05 Think about the past** Texturing is an important story-telling element if it is done right, this really helps if you are painting sweat, dirt, dust, wear and tear, scars and so on. Was your character having a fight? Was it running? Is it healthy or is it sick? Making up little stories in your mind helps facilitate the process. **Arda Koyuncu**

**06 Work closely with modellers** It's very important to be on the same page with your colleagues when it comes to the UVs and their organisation. This will help you to be efficient in the way you set up the different materials and the size of the UVs in a tile, which will determine the resolution of your textures (eg 2K, 4K, 8K per tile). **Myriam Catrin**

**07 Create a great UV layout** A quality UV layout is vital for establishing a rock-solid texture for your 3D model. Whether it's a simple object or a complex character, in order to properly place the texture the UVs need to be mapped effectively. This process is often tedious and not a very exciting one, but like it or not it's got to be done. Without a good UV map, the textures can become distorted or stretched. There are some great applications out there that can make this process easier. For instance, UVLayout is a great software designed for the sole purpose of laying out your UVs. **Digital Tutors**

**08 Test the UVs** You have to check if the UVs are all homothetic – the same size for all the pieces of geo – and if there's any stretching. To test this, we generally pick the asset and apply a tiled map with a grid, featuring numbers and letters in different colours. This pattern has no mercy: you will detect very easily if there's stretching and a difference of resolution between two parts. **Myriam Catrin**

**09 Deal with UV seams** Seams are something you really can't avoid when it comes to texturing. Of course, it's always good to keep seams on the underside of a model, and in areas that won't be directly visible. In order to help hide seams you can utilise a 3D paint tool in your application. This enables you to clone specific areas on your texture and copy that area directly on top of the seam. This is a very quick and effective way to hide UV seams. **Digital Tutors**

**10 Handpainting versus the use of photo projection** Generally speaking, projecting photographs is important when you are reproducing something, such as an animal, person or building. However, handpainting comes into play when you are tasked to create something that does not exist, such as an alien creature, spaceship or other fantasy subjects. Ultimately I feel that the most successful texture artists are those that can marry the two creative areas, weighing whichever technique results the best for their asset. **Nicolas Garilhe**

**11 Remember that edges are important too** Edges are important when it comes to hard shell stuff. If you are texturing things like leather belts, boots, metal armor, wooden planks, you can use the edges to show the age, quality, hardness and so on of the object. **Arda Koyuncu**

**12 Be picky with the resolution** I will work in MARI for the colour, with double the resolution of the final exported set of textures. This enables me to paint with fine brush details without any pixelation. **Myriam Catrin**

**13 Gradients are cool!** Gradients can be used to create a certain separation on the organic surfaces. Dorsal-ventral or proximal-

## Texturing with references: a workflow
Myriam Catrin

When you start an asset that already exists on set – like a digi-double – most of the time, the production organises a photoshoot of the object or character with the costumes in the studio. This means that you will get helpful references for every angle in polarised and nonpolarised forms, so let's not speak about this one. Let's go ahead and focus on an alternative case – the asset that you will build from scratch.

For creatures, monsters, alien and humanoids, the art department generally works on concepts to propose different options to the director, producer or supervisor.

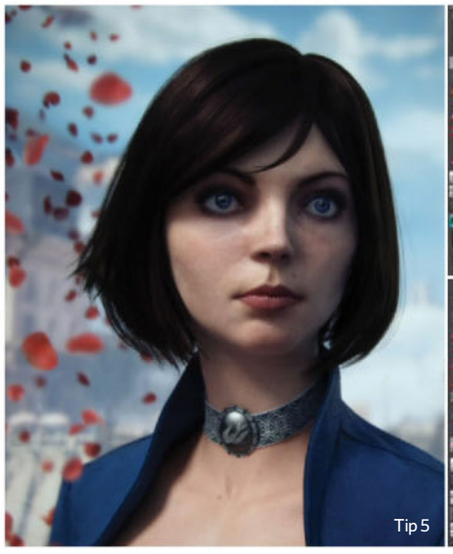
This gives a really great idea of what is wanted, but still the texture artist needs to create his/her own references and submit them to his/her supervisor, before starting to paint anything.

In these cases I start the painting itself way later in the process. At first, this looks like it's kind of stressful because I don't jump straight in to texture the asset, but the more care I give to the preparation of elements, references and how I will organise my work beforehand, the faster and more efficiently I will generate the textures themselves. This way of working also enables me to be way more creative and spontaneous to change everything if I feel like it doesn't work.

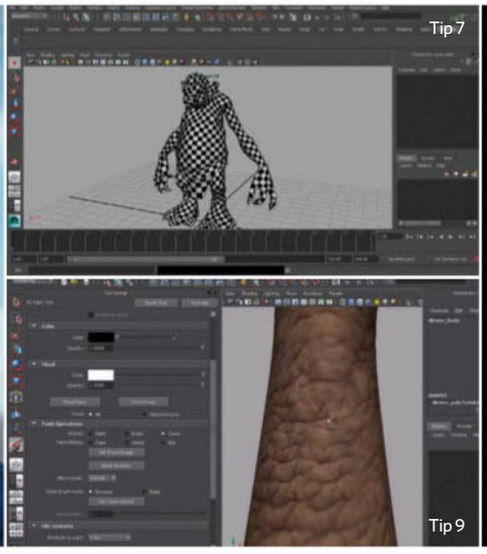
Year after year, I took pictures – crappy pictures artistically but gold for the texture artist! I have now built up a library with different elements I use all the time.

I colour correct the references in Photoshop to make them more 'neutral', meaning not contrasted, and not too saturated, kind of linear-like. If I need to saturate them later I will do this process in MARI if needed. I try to have a library ready to import to MARI that's consistent in values and colours.

*Harbour* by Armando Savoia



Tip 5



Tip 7

Tip 9

*Dreamkeeper's body* by Myriam Catrin

distal separation always looks interesting on characters or creatures and it is a good opportunity to introduce new hues to your colour palette too. **Arda Koyuncu**

**14 Avoid repetition** One of the hardest parts of texturing is to avoid the unwanted repetitions of patterns or obvious symmetries that may end up appearing in your work. There are several plugins that can help you create good tileable textures. **Germano Vieira**

**15 Render as soon as you can** Don't wait aroung too long trying to achieve a perfect painting before you start rendering. I try to base my corrections and the finish of all the textures on early renders and this can include: watching out for any details, whether the colour appears too bright and out of place, whether specGain is too high so it looks shinier than it should, if displacement is not enough in some areas or too noisy in others, and more. **Myriam Catrin**

## Bring things into focus Justin Holt

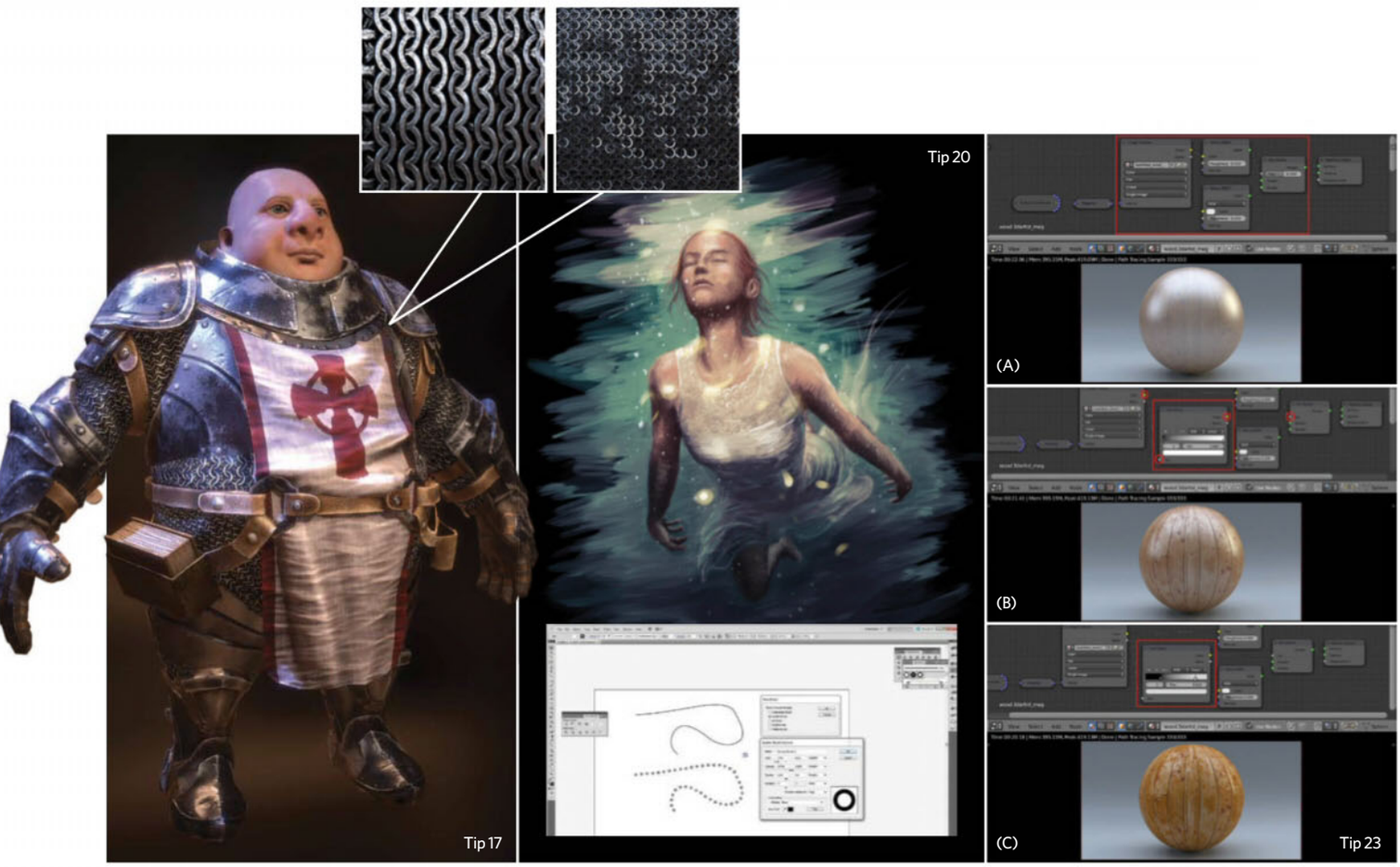
When I say "bring things into focus" I am referring to the process of building your textures up from the broad strokes to the fine strokes, just like in traditional painting. You need to think about laying down the foundation before you can go in and detail things.

There is a catch – when you begin, and for a bit of time after, your textures simply aren't going to look good. In fact, you will inevitably feel moments of self-doubt because your work doesn't look like either the concept art or photos you are trying to match. Just remember that this is all a part of the process.

Your textures will look out of focus, blurred and soft in the beginning but by laying down the foundation here, the magic will happen later because this process will force you to deconstruct what you actually see in your reference in order to build it back up nondestructively.

So often people want to find that perfect photo reference image and quickly project all the wonderful details on their models and call it a day. Yes, the colour maps will look great but the problem arises when creating all of your secondary maps, from your Bump to Spec to Isolation mask maps. Since everything is baked in, pulling out all of those details will be a very difficult and inefficient task. By bringing things into focus, you now have complete control over all attributes of your colour maps because every detail has been considered as a separate layer.

So, with the next asset you begin to paint, I want you to think about taking a moment to deconstruct your reference image(s) from macro broad details down to micro fine details. Like in traditional oil painting, think about bringing things into focus by roughing in the foundational broad stokes. Resist the urge to begin with fine details. This in turn will enable you to assess your work from a basic compositional perspective, judging things like broad colour balance and general aesthetic. When all of these things are resolved, then layering in the secondary and tertiary details will simply be icing on the cake!




# TECHNIQUES

**16 Texture portraits** Usually when modelling a portrait you will be using a photo reference on an image plane. A cool trick is to project that photo reference onto your model as a Diffuse map. Right away you will be able to check your proportions, your landmarks, and where more sculpting is needed. With the photo reference as a Diffuse map on top of your model, it will enable you to rotate and sculpt with multiple camera angles. Just keep in mind you will have to reproject the more you sculpt to keep the original photo from deforming too much. **Ian Spriggs**

**17 Create chain mail in Substance** To create a chain link pattern in Designer, I create a Tile Generator node on a new Substance graph and change the following parameters on the graph: Blending Mode to Max, Checker Mask to True, Quincunx Flip to True, Pattern Type to Image Input, and the Scale to 3. This creates a checker pattern and rotates each instance of the shape 90 degrees. Now I create the shape of the individual link. I begin by subtracting a small paraboloid shape node from a larger one. I then tweak the luminosity and shape using a gradient map and levels. Finally, I create a Gradation shape node, rotate it 45 degrees, and multiply it onto the ring shape. This should create a tilted chain link shape. I then take that shape and plug it into the Image Input of the Tile Generator node, to create my chain link pattern. **Arvin Villapando**

**18 Control details with the Roughness map** I make sure that the Diffuse map is not too contrasting and then I control the details with the Roughness map. The benefit of using the roughness as the main detail-defining texture for the PBR material is that it has a very nice response to the lighting in the scene. Usually I also use a Reflectivity map to exaggerate the highlights in the texture. **Martin Teichmann**

**19 Paint Diffuse maps** When painting Diffuse maps I will never paint the highlights or shadows. Even though this might create a nice style for your work I have found that when trying to re-create realism it is best to let the light in your scene decide where these hotspots and shadows will be. **Ian Spriggs**

**20 Use Adobe Illustrator** Adobe Illustrator probably isn't the first thing that comes to mind when people think of textures, but it definitely deserves a look. It has some sweet tricks up its sleeve that can save you ridiculous amounts of time. Give the Scatter brush a try, it places shapes of your choosing around a path. I've used it for rivets, stitching, tyre treads and more. And the best thing about it? It's bigger, smaller, more random, and it's all changeable with the press of a key too! No more repainting hundreds of rivets by hand. Huzzah! **Mark Young**

**21 Create knitted textures with Maya and ZBrush** When I made the knit, the most important things were shader and texture. For shading, I used the SSS shader in mental ray and added short hairs, which was very important for making the knit look real. A Displacement map was created in ZBrush, and I made some Alpha brushes for the texture and added details in ZBrush. The short knitted hairs were made with nHair in Maya. **Jung Won Park**

**22 Use procedural maps to create textures** Procedural maps are time-saving and helps generate the type of randomness found in nature. It also lets you work in a nondestructive way. One good example is the Substance plugin that already comes with 3ds Max's latest versions and has a vast library of Textures and Noises that can be upgraded. **Germano Vieira**

**23 Create a Specular map from an image in Blender** If you don't have access to dedicated software that can generate Spec maps, you can work around this in Blender by using the base image as reference. To do so: **(A)** set up a standard Diffuse (with image input) and Glossy Mix, **(B)** attach a ColorRamp Node between the Image Texture and the Mix Shader node and finally **(C)** adjust the ColorRamp Node as you see fit. **Reynante Martinez**

**24 Make dragons** When we worked on *The Hobbit* films, what was unique about Smaug was almost... everything! The

Tip 21
*Portrait of Sylvia*
by Jung Won Park

## Use a Normal map and Displacement map simultaneously
Reynante Martinez

**01** Utilising both Normal and Displacement Maps adds a lot to the realism of the surfaces in 3D, and they are very fun to play with too.

**02** Add the Normal Map and Displacement Map as Image Textures, making sure they're both set to Non-Color Data.

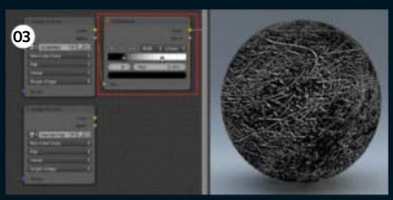
**03** Attach a ColorRamp Node to the Displacement Map Texture and adjust the sliders to create more definition.

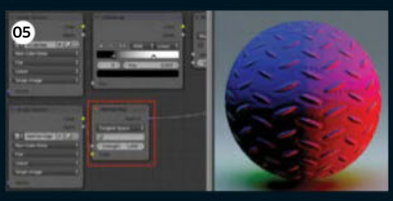
**04** Attach a Math node set to Multiply to adjust the amount of bump.

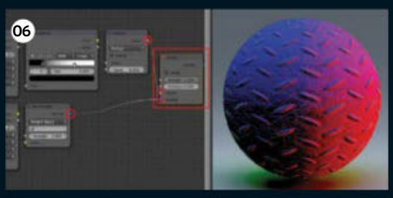
**05** Attach a Normal Map Node to the Normal Map Texture.

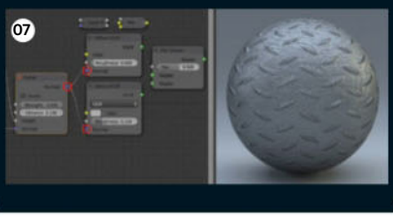
**06** Combine the Displacement Map and the Normal Map using a Bump Node.

**07** Finish up by plugging the Normal Output of the Bump Node and the Normal Inputs of your shaders.





## Use Edge Maps in Blender Kent Trammel

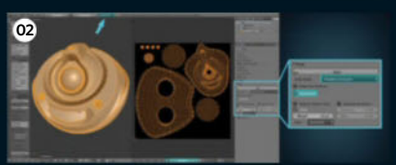
**01** An Edge Map can be a very useful texture for isolating the hard, convex edges of your model. To achieve this with Blender, we'll manipulate the Ambient Occlusion baking feature. This sci-fi orb model is a perfect candidate for an Edge Map.

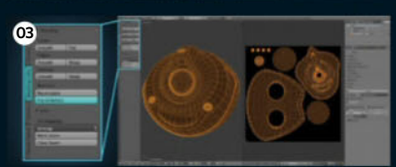
**02** Using the Blender Render engine, locate the Bake options in the render properties panel. Set the Bake mode to Ambient Occlusion and check Normalized. **Note** Our model's UVs are already laid out and have a blank image texture called edge_map assigned to them.

**03** In Edit Mode click the Shading/UVs tab in the 3D View toolbar and click Flip Direction in the Normals section. This will reverse all the face normals, flipping the model inside-out.

**04** Jump to World in the properties panel. Below in the Gather section, decrease the Distance to 0.01, check Falloff, set the Strength to 5, and increase the Sampling to 16. **Note** These settings are dependent on your model's dimensions and scale – basically, decreasing distance and increasing falloff strength will limit the ambient occlusion effect to the sharpest crevices.

**05** Jump back to the Bake settings and click Bake. See in the image how our newly baked Edge Map appears on the model: hard edges crisply defined in black while everything else is white. The image just needs to be saved and inverted for use as an edge overlay on your diffuse texture or as a mask to define shinier edges in your shader. **Note** Don't forget to flip your model's normals back for rendering! **TIP** Using two Edge Maps with different ambient occlusion attenuations can be a powerful, flexible combination.



Alexey Fanta

Tip 26
(concept by Georgi Simeonov)

*Service Station* by Armando Savoia

Tip 30

excitement, the pressure, the size of him and the scale of him! We had to be careful with the flow of scales so he looked natural. On big areas like the back, the top of the head, the front legs were big, deadly scales – the size of a human being. On the tender parts like the palms of his hands, the soles of his feet and the soft parts of his face like around the nose or the eyes, we did tiny, little scales like a chameleon or an iguana. Then of course there was a scale progression. This did not appear too soft like a gradient, but had break-ups like all of the lizards we mimicked, placed between the hard parts of his body with bigger scales and the softer parts with small scales. **Myriam Catrin**

## 28 Make multicoloured brick pattern environments

This lets the user create a brick pattern with random colours from a given colour range. I first create my brick pattern using the brick pattern node. Then I duplicate that node to ensure that the tile settings are exactly the same as the initial node. On the duplicated node, I set bevel x and bevel y to 0, and height variation to 1. This creates a pattern of bricks ranging in luminosity from white to black. Finally I plug that pattern into a gradient map. For each stop I create on the gradient map, I set a variant brick colour. I then use this pattern as my initial colour map to texture my bricks. **Arvin Villapando**

## 25 Use the Fill particle brush to quickly mask areas in Substance Painter

Particle brushes can have a lot of utility, but one utility that might be overlooked is that it can be used to quickly fill areas. It's particularly useful when you need to paint a mask for example. By default, there's already a particle brush preset called Fill, which fills in surfaces based on the normal angle of the mesh with the Normal map taken into account. **Nicolas Garilhe**

## 26 Texture scraped wood in Substance Designer

To create a scraped wooden texture for my shotgun handle I use a simple grunge map inside Substance Designer and run my completed wood texture into a Material Color Blend node. For my mask I use grunge_map_003 and set the following parameters: Balance to 0.23 and Contrast to 0.86. This gives me a vertical scratch pattern with solid borders. I plug that into my material colour blend mask, tweak colour blend settings, set my diffuse or base colour to be lighter than my initial wood colour, and the roughness to be smoother. This creates the appearance of the wood being scraped and scruffed from repeated use and wear. **Arvin Villapando**

## 27 Apply overlay effects for creature creation

For creatures, I paint a base with a brush that gives me different nuances, then I work with layers on top mixed in overlay, softlight or multiply. For instance, when I textured the Trilobite in *Promotheus*, I didn't use photos as this character needed to be fleshy, with snail-like skin. I painted all the nuances directly, but on top, I added a layer in overlay of a photo of peeling painted wall (tiled), in black and white so I got only the dark peeling parts. The final effect gave a decayed look to the skin. **Myriam Catrin**

## 29 Introduce colour with a Gradient map in Substance

The Gradient map node is a great starting point to introduce colour to your height map, greyscale image or noise generators in Substance Designer – all because of Pick Gradient. First you draw a stroke around the place in the picture where you like the colours, and depending on how you draw the stroke, Gradient map node makes a gradient. From there you can make as many colour variations as you want! **Alexey Fanta**

## 30 Texture for Unreal Engine with Quixel DDO

Dynamask Editor lets you generate unique blend masks based on texture maps that you plug into it, like Normal and Ambient Occlusion maps. To get the black-and-white mask that the Dynamask Editor generates, select the top layer in the _mask.psd file that DDO generates, Select All (Cmd/Ctrl+A), Copy Merged (Cmd/Ctrl+Shift+C), and then create a new document and paste it in. That gives you a quick base for a nice custom blend mask. If you are using Unreal Engine 4, you can combine up to four of these texture masks into a single texture by pasting the separate greyscale textures into the R, G, B, and Alpha channels of a new texture document. It gives you more blend options, while also saving memory and being more efficient. **Joshua Marlow**

## Having an eye for colour Myriam Catrin

In terms of other important techniques that aspiring texture artists need to know, colour corrections is the key – being good at judging colours, values and how to balance them.

Work on your eye, whether it's working on on MARI, NUKE, Photoshop or any other software. Train it to colour correct and being good at seeing all kinds of colour subtleties to translate them into a CG environment. Look development as well is important. Texture doesn't only involve a beautiful colour, all the secondary maps (Specular, Displacement) are as important as colour. Being familiar with balancing or painting them is a part of look development and look-deving should be an integrated part of texturing.

42 PAGE PIPELINE SPECIAL

# Technique focus

**Incredible 3D artists take us behind their artwork**

**TEXTURING** For wrinkles and multicolour spots I created Alpha brushes. At the polygonal drawing stage I used Mask by Cavity and filled spots with a dark colour. This gave the effect of texture like dirt in the pores and folds. When I was finished, I unwrapped in 3ds Max and I used VrayFastSSS2 and 3ds Max for fine-tuning.

**Alexander Lyan**
**behance.net/Allyan**
**3DArtistOnline username**
Alexander Vyacheslavovich Lyan

**Software** 3ds Max, V-Ray, ZBrush, Photoshop

**Drunk Monkey,** 2015

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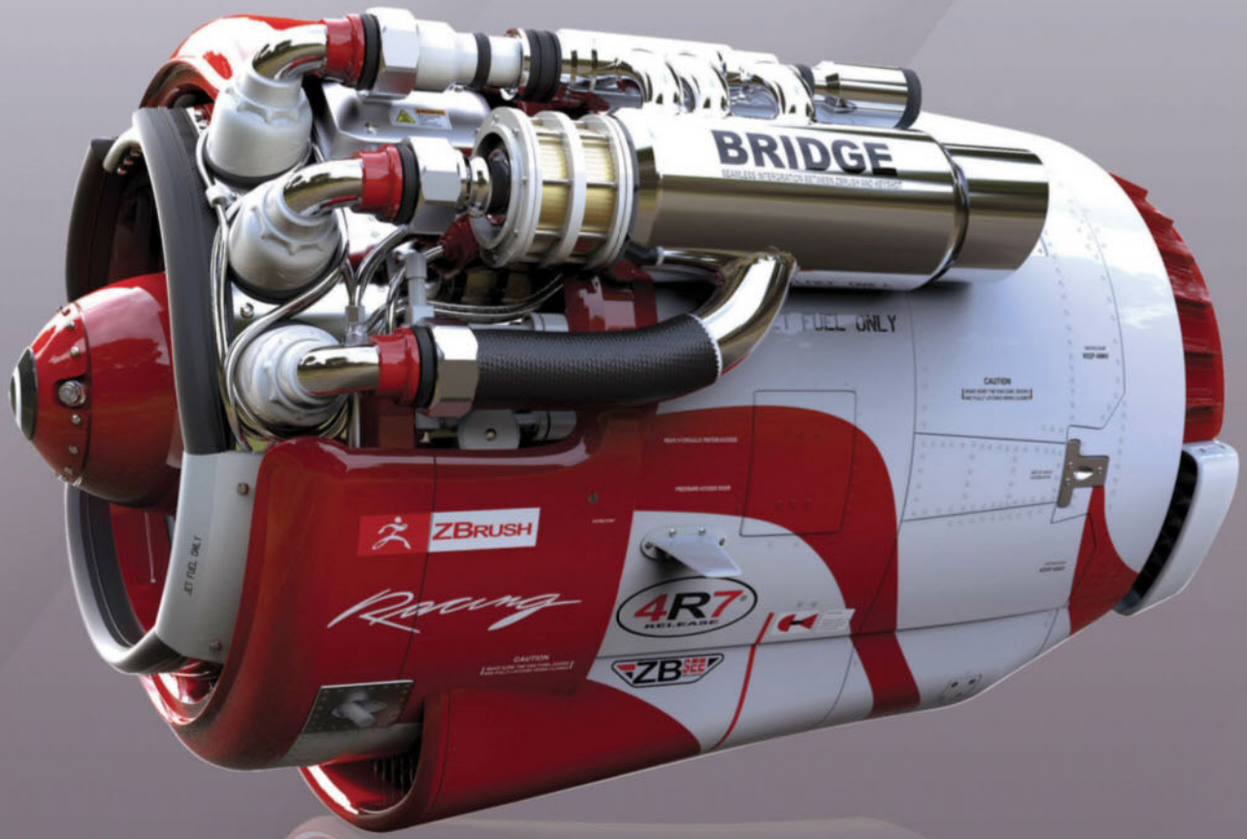


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# YOUR **NEXT CAR** WILL BE **PRINTED**

A future where you'll be able to design, model and 3D print a new car is much closer than you'd think. We take a look at the people working to get there

**Jean Paul Capin** / **localmotors.com** / CFO of Local Motors **Jim Kor** / **korecologic.com** / Founder and president of KOR EcoLogic **Lonnie Love** / **ornl.gov** / Leader of ORNL's Manufacturing Systems **Ivan Sentch** / **replicadb4.com** / Creator of the Replica DB4 project **Dan Walmsley** / **strakkaracing.com** / Team principal, Strakka Racing

All Shelby Cobra replica photos © Oak Ridge National Laboratory

Most people don't realise that 3D printing techniques have been used by auto manufacturers for decades to be able to prototype and test the cars we drive every day. Like in many other industries, however, it has become evident that the role of 3D printing technology in our vehicle manufacturing process has been evolving drastically. We may now be facing a whole new era in automotive design: where it's the real cars, not just the prototypes, that are made up of 3D printed parts.

"When we first started with the possibility of us actually doing 3D printing on a large-scale format, for vehicles, it just clicked. To me, this is the future," begins CFO of Local Motors, Jean Paul Capin.

His team made headlines at the 2015 North American International Auto Show when they showcased the world's first fully driveable 3D printed car. Instead of using the Auto Show to debut their finished vehicle as is expected, Local Motors fully printed and assembled it live on the show floor.

The ultimate result was the Strati. Like the car's name – the Italian word for layers – suggests, the futuristic-looking two-seater was made up of 212 layers of black ABS plastic reinforced with carbon fibre. It was designed to be drastically part reduced with less than 50 parts: far fewer than the average 2,000 parts found in most vehicles, and took only 44 hours to fully print.

Today, Local Motors has big plans for making the Strati the ultimate vehicle for the future, and they're far from the only ones. KOR EcoLogic Inc. is a team who hopes to break a Guinness World Record with their own 3D printed car, while Strakka Racing is testing how 3D printing can improve velocity and endurance at the world's most extreme speeds.

For 3D artists, this could involve a whole new type of CAD job. Everyone would suddenly be able to have a unique, environmentally friendly car specifically customised to be perfect for them. You could even design, model and 3D print your own car, or create the next classic design – Local Motors, for one, is always on the lookout for people from the 3D design world to help. If your passion is rendering incredible vehicles then you could make the renders into a physical reality some day.

## THE DIY CAR

On 1 February 2013, New Zealand-based car enthusiast Ivan Sentch created the first post in a blog that would make him famous. It described what he calls the Replica DB4 Project: an enormous undertaking that will involve building an exact, full-scale replica of a 1961 Aston Martin DB4 Series II that is normally worth hundreds of thousands of dollars – all from scratch.

The plan was to create a fibreglass body by first making a plug, taking a mould from that plug, and casting the body in fibreglass from that mould. The mechanics, including an engine, drivetrain and suspension, would come from a donor car – a Nissan Skyline GTS25T. The Nissan was pretty cheap at $4,000 NZD and fast, offering 250hp at 7psi and an intercooled standard, with no internal changes required to run 12psi.

It was when he began to look into creating a plug, however, that Sentch encountered his first problem: being quoted $12,000 to $15,000 NZD for it by a local CNC cutting shop. "I went down the 3D printing route because it was cheaper than having the shape CNC cut out of foam, which is the normal process," explains Sentch. By using a Solidoodle 2 desktop 3D printer to create the plug for his replica Aston Martin DB4, the price came in at just $2,250. Suddenly, Sentch found himself using 3D printing to help create his incredible car at a price that was much more affordable, and it opened up the idea of printing a car as a real option to anyone else tempted to do the same thing. The project is currently a work in progress, and will take several more years to complete.

"The biggest issue has been keeping the prints stuck to the bed with the tall (105mm), skinny (5mm) prints which come loose at the ends, then distort as they cool," Sentch continues. "Often, this is either unuseable or the print detaches completely and I end up with a ball of extruded string. So bed temperature is a factor – too much and it distorts, too little and it comes loose and distorts, I've also applied the technique of using a sheet of heat-treated glass on top of the bed, Kapton tape on that, and hairspray, which seems to work. Even with good prints, sticking so many bits together has an accumulative effect and results in gaps in the final constructed object. I've tried to manage this by using an underlying framework to stick the bits to."

To be able to create the cross sections of the Aston Martin that he then prints piece by piece in the Solidoodle, Sentch uses a more familiar piece of software: 3ds Max. He first gives each object depth with the Shell tool by specifying an inner or outer shell depth, then he uses the Slice tool to create all the slices needed to separately print. These are detached and capped using the Element selection tool, Border selection tool and the Cap tool; before being rotated to make sure they're at an angle appropriate to 3D printing and finally converted to G-Code using Skeinforge to print each piece.

## A CAR TO-ORDER

Soon after, Sentch began to change the way of producing DIY replicas. Local Motors took things one step further when the team printed the Strati for the first time.

With the Strati, it was not just the plug that had been 3D printed, but almost the entire final car itself. All the mechanical components of the vehicle such as the battery, motors, wiring and suspension, are sourced from Renault's Twizy, an electric-powered city car. Everything on the car that wasn't mechanically involved, including the entire chassis, exterior body, and even some of the interior, were all fully printed in a single shot.

> "You can print out a working vehicle in a matter of days or weeks. You can test it for form, fit and function. Your ability to innovate quickly has radically changed"
>
> **Lonnie Love, leader of ORNL's Manufacturing Systems**

The way this was done was through BAAM, or Big Area Additive Manufacturing (Bad Ass Additive Manufacturing if you ask the right people). Pioneered by the US Department of Energy's Manufacturing Demonstration Facility at Oak Ridge National Laboratory, a BAAM machine represents a new way of printing that uses a lot of the same ideas as everyday desktop FDM 3D printing, but at a much larger scale. The process, like with desktop 3D printing, relies on a CAD part sliced into layers from which paths are generated to eventually print out in the real world, slice by slice. The main difference – aside from the sheer size of the printer and build volume required – is the feed system. Not only would the BAAM machine need to be capable of printing parts in sizes greater than one cubic metre, they would need to be manufactured to be both strong and lightweight enough for a car as well.

To be able to successfully 3D print the Strati, Local Motors used a pellet feed as opposed to filament-fed extruders, which made raw materials cheaper. The pellet feed system also enabled the team to experiment with more material combinations: for that crucial lightweight strength, the final Strati was printed from a carbon fibre composite ABS. The same material would have been very difficult to find in filament form.

"You would assume that the technology would be very similar as we were just increasing in size, but there were a lot of things that were very different," tells Capin, explaining that the Local Motors team only had one advantage: they were already familiar with MakerBot desktop 3D printers for prototyping cars before starting work on the Strati. "We realised nothing like this had existed, we kind of took what a desktop 3D printer was and we sized it up, and that was the first thing we did."

"From a material perspective you can't scale up that easily," he continues. "There needs to be some adjustment that relates to the difference in temperature as the material gets deposited. We started with an open nonheated cabin and then we moved to a heated cabin to keep the temperature more consistent throughout the plate."

To build on their collaboration with the Strati, the Oak Ridge National Laboratory has even used the BAAM for another 3D printed car: a replica of a classic Shelby Cobra in celebration of the racing car's 50th anniversary. The shell, chassis, passenger monocoque, grill and the headrest brackets were all 3D printed. In fact, the 1,400-pound vehicle contains 500 pounds of printed parts made of 20 per cent carbon fibre, which in total took 24 hours to print with the BAAM machine – the same amount of time that Local Motors aims for the Strati to be built in the future.

"Our goal is to demonstrate the potential of large-scale additive manufacturing as an innovative and

New Zealand car enthusiast Ivan Sentch's Replica DB4 Project in progress. The entire plug for the body will be 3D printed and used as a mould © Replica DB4 project

The process of printing the Strati took 44 hours, but the goal for the next stage is to speed the print rate up to cut the process to just 24 hours. All Strati photos © Local Motors

viable manufacturing technology," says Lonnie Love, the leader of ORNL's Manufacturing Systems Research group. "You can print out a working vehicle in a matter of days or weeks. You can test it for form, fit and function. Your ability to innovate quickly has radically changed."

The natural next step is to start letting customers around the world order and buy the perfect 3D printed car to suit their unique needs. For Local Motors, this would all be made possible through the use of hundreds of local microfactories. These would be easy to access for customers and would also create hundreds of local jobs, reduce waste and distribution costs, and be much more eco-friendly than the enormous auto manufacturing factories that populate today's markets.

As if this wasn't enough, Capin has plans for much more. While Local Motors is currently aiming to sell the Strati for between $18,000 and $35,000 in the US, the CFO explains that after his own experience growing up in the developing world, he's already thinking about the possibility of using 3D printed vehicles like the Strati to help change lives in more impoverished countries too. "I'm already thinking about what we can do in India, what we can do in Africa, what we can do in other countries that would really normally not allow for a production facility to happen," he reveals.

Already, Local Motors has begun opening factories near major cities and in the next ten years, the team plans to have launched 100 factories around the globe.

## Large-scale 3D printing

The software that helped the BAAM machine to create the Strati was all developed in-house. Local Motors, however, is very keen for more and more 3D artists to try large-scale printing out for themselves. Together with partners such as Autodesk, the team is currently working to modify its software to let any artist digitally preview the way their own car design, or any other structure, would actually print at a large scale. "That's the next evolution for us," Capin explains. "From a learning perspective this will be great for our community and for every other 3D artist out there."

The 3D printed Shelby Cobra is set to be used as a laboratory on wheels. Components such as fuel cell technologies will let researchers quickly test new ideas

### 3D printing for racing

The concept of 3D printing has not just been a useful piece of technology for future city cars. Modern race cars have been using 3D printing too.

UK-based Strakka Racing is one of the incredible motor racing teams leading the way. Following a technical parternship with Stratasys, the Strakka team has been building fully functional 3D printed end-user parts for its Strakka Dome S103, to be used specifically for one of the toughest race environments in the world.

The Strakka Racing team competes in the World Endurance Championship, and its cars will need to be able to race more miles in a day than the typical F1 car will do in a year.

For now, only around five per cent of the finished race car had been 3D printed. However, due to how much faster parts can be made available with 3D printing, when compared to manufacturing methods, this figure is set to increase drastically to even 70 to 80 per cent over the next ten years.

## SAFEGUARDING OUR FUTURE

Local Motors and the the Oak Ridge National Laboratory, however, are not the only two companies set to change the future for so many. Another breakthrough design for 3D printed vehicles came with KOR EcoLogic Inc's URBEE, or 'Urban Electric, with ethanol as backup' project. Featuring an FDM printed body built in collaboration with Stratasys and Autodesk, the result was the Urbee 1: a working prototype of a daily-use car with one very unique feature – it was designed to be the greenest practical car in the world.

To bring such a future-friendly idea to life, the KOR EcoLogic team had to work towards moving automotive technology away from fossil fuels, steering the car to work solely on renewable energy instead. Electric motors provided for the initial acceleration for the vehicle, while an internal combustion engine powered by ethanol would extend the range of travel efficiently on long journeys when travelling at steady speeds. The idea of 3D printing parts for the final car actually only came later in the process.

"Jeff Hanson, the visionary at Stratasys, introduced me to the idea of using 3D printers to make production parts, or end-user parts," begins Jim Kor, president and project leader of KOR EcoLogic Inc. "It took me several years to fully get what he was saying. Going to many 3D print shows around the world, because of URBEE, helped change my mind."

Luckily the first step towards 3D printing the body of the Urbee 1 was complete. The team had already built the complete model in 3D from the start using Autodesk Inventor. From there, the workflow to creating the finished prototype car, which used very few existing components from the typical cars of today, involved first creating a sixth of the scale model in the same 20 separate panels and window templates that would be used for the real Urbee 1 body. Once it was confirmed that all the pieces of the model fit perfectly, the files were

> "The goal is to make extremely light, yet incredibly strong parts – parts designed exactly for the purpose they must fulfil in service"
>
> **Jim Kor, president and project leader of KOR EcoLogic Inc**

The Strakka Dome S103 race car is made up of fully functional 3D printed parts strong enough to last through the World Endurance Championship. All racing car photos © Strakka Racing

scaled up to actual size. The full-size body panels were then mounted onto the Urbee 1 prototype chassis, while the solid plastic 3D printed window panels were used as templates for making the glass and plastic windows.

"We learned an enormous amount from Urbee 1 as a first prototype," Kor explains. He reveals that the KOR EcoLogic Inc. team are currently working on the URBEE 2, a road-legal car that will take everything the team has learned throughout creating Urbee 1 and put it into a brand new iteration of the project. Incredibly, after the experience with the Urbee 1, the KOR EcoLogic Inc team now plans to create a huge 60 per cent of URBEE 2 using 3D printing tech. Kor has hopes that this percentage will increase if metal 3D printing is adopted within URBEE 2.

With URBEE 2, KOR EcoLogic will not only be bringing the weight of the car body down from its current 725kg (1,600lbs), but will also be testing a new 'solar garage' an alternative to charging the battery by plugging the car into an outlet. Small panels on the garage roof would then also work to generate enough electricity to run the URBEE up to 50km per day. The team even plans to break a world record by driving the URBEE 2 2,905 miles – 42 hours of driving time from New York to San Francisco – all without ever needing to fill up a tank.

"The goal is to make extremely light, yet incredibly strong parts – parts designed exactly for the purpose they must fulfil in service. As we find in nature, we try and create components and systems without excess," tells Kor. "Another challenge is to design for safety. We want URBEE 2 to be able to pass the Le Mans race vehicle inspection."

"If we are to thrive as a technologically sophisticated, sustainable, global civilisation, we need to design differently," he stresses. "We must steer towards products that have no bad side effects and most importantly, make us act more sustainably. Our products change us. They should change us for the better."

## TECH SPECS

### Shelby Cobra replica

The headrest brackets were 3D printed using a titanium composite, whereas the grill was 3D printed with polymer materials.
**Horsepower** 100kW or 135hp
**Weight** 1400-1500lbs
**How was it finished** Sand, filler, primer, standard automotive paint (BASF base/clear)
**Concept to driveable car in** 6 weeks, 6 guys
**Range with full charge** 30 miles
**Print time (continuous)** 24hrs
**Print material** 15-20 per cent CF-ABS
**Print cost** $5/lb for 500lbs = $2,500
**Top speed** 70-80mph
**0-60 mph** Under 4 seconds
**Battery** Standard Li-ion

### Strakka Dome S103

**Chassis make** DOME
**Chassis type and material** Carbon monocoque
**Bodywork material** Carbon fibre composite
**Engine** Nissan Nismo VK45DE 4.5L V8 normally aspirated
**Power** 480bhp estimated
**Transmission type** Xtrac 6 speed sequential
**Front/rear/4WD** Rear-wheel drive
**Front suspension type** Double wishbone
**Rear suspension type** Double wishbone
**Damper – number and type** Hydraulic, gas pressurised
**Brake disc material** Brembo, Carbon fibre
**No of calipers/no of pistons** 4 Brembo 6 piston calipers
**Tyres** Michelin
**Wheel diameter and width** Front and rear diameter 18in, front width 12.5in, rear width 13in
**Regulation weight** 900kg without driver or fuel
**Fuel tank capacity and location** Maximum 75 litres

### The Strati

**Engine** 100 per cent electric
**Features** Electronic engine immobiliser, regenerative disc brakes
**Drivetrain** Front and rear, rear-wheel drive
**Transmission** Automatic, single speed
**Battery** 6.1kWh battery, 62-mile range, 3.5-hour charge time
**Motor** 5bhp or 17bhp, 42lb-ft torque
**Body** Approx 212 layers, direct digital manufactured vehicle (DDMV), bodywork material – carbon fibre reinforced ABS plastic
**Top Speed** Approx 50mph
**Wheels** Custom made by Fifteen52

### URBEE 2

**Engine** Parallel/series hybrid (electric/IC engine)
**System** Electric motors drive front wheels and acquire energy from batteries, while a small piston engine runs alternator to charge battery bank; batteries can also be charged by a built-in charger from a standard wall plug (takes six hours); the piston engine drives wheels directly
**Drivetrain** Dual drive train 4.5:1 silent chain and sprocket
**Front motors** Two series-wound DC motors, one driving each front wheel 4 hp/side (continuous) 8 hp/side (peak-intermittent)
**Dimensions** Length 10ft, width 5ft 2in, height 3ft 6in
**Ground clearance** 5 in nominal (variable)
**System voltage** 36V
**Battery bank** Stored energy 10.9hp-hr total (20hr rate) 5.5hp-hr total (2hr rate)
**Chassis** 'Exo-skeleton' safety-cage surrounds occupants. Restraint system keeps occupants within cage. Front, side and rear crush zones built into structure. Birdcage chassis of welded, structural tubing. All mechanicals sealed from outside dirt and grime. All maintenance and repair done from above
**Body material** ABS plastic for the Urbee 1, URBEE 2 not yet set
**Engine specs** 5hp (continuous) at 2200rpm, 10hp at 3000rpm
**Fuel usage** Goal is: 0.81 litres/100km
**Fuel tank** 10 US gallons
**Wheels** 3 wheels, 2 in front single at rear. Rear wheel steering, patented high-speed stability control

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# Technique focus

**Incredible 3D artists take us behind their artwork**

**MODELLING** I wanted to create a machine which could have been built by a machine in the near future – something lean and brutally efficient. The absence of a human rider let me concentrate on creating a bike that was engineered without comfort in mind. All work was done using Cinema 4D and I used OctaneRender to capture a bleak, cold, studio shot.

**Paul Massey**
**artstation.com/artist/zeclipse**
**3DArtistOnline username**
EclipseCGI

**Software** Cinema 4D, Octane, Photoshop

**ReK/R Drone bike,** 2014

man machine

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42 PAGE PIPELINE SPECIAL

# Model and texture a Roman Centurion

## Bring a detailed legend to life in just a few steps

In this tutorial we will take you through a typical workflow for designing and creating this type of epic character. This tutorial was written in a way so that it can be easily followed by anyone with at least a basic understanding of 3D software. We will start off in ZBrush 4R7 to build the character, switch over to Marvelous Designer 4 for cloth elements and create our weapons in 3ds Max.

Finally, we'll finish up by showing you how to quickly create some realistic renders with KeyShot 5 via the new Bridge feature.

“Starting off with a base mesh, subdivide a few times and build the head using mostly the Clay brush and Standard brush”

**DAMON WOODS**
*The Centurion,* 2015

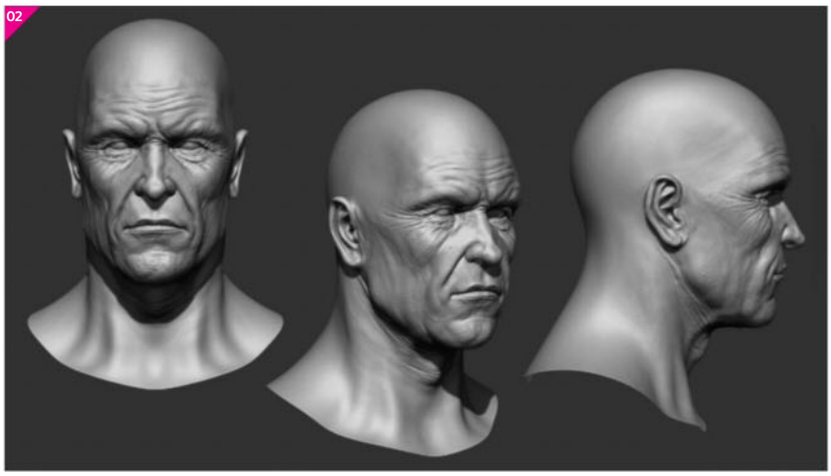
### Software
ZBrush, 3ds Max, Marvelous Designer, KeyShot

### Learn how to
- Mask armour in ZBrush
- Create ornate armour designs
- Make realistic drapery using Marvelous Designer
- Create custom insert brushes in ZBrush
- Construct realistic hair using ZBrush FiberMesh
- Easily render photorealistic images using KeyShot 5

### Concept
My inspiration came from the amazing armour designs that I've viewed in museums from various empires in history.

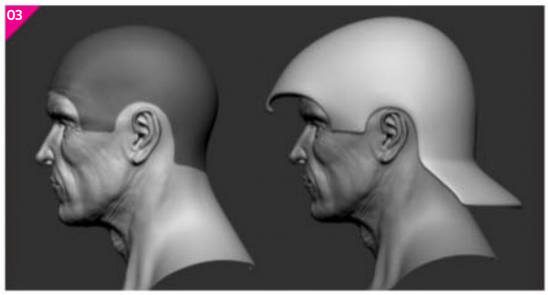
**YOUR FREE DOWNLOADS** from **filesilo.co.uk/3dartist**
- Scene files
- Tutorial screenshots

**01 Gather good references** Before we start up any programs, spend a good amount of time gathering references as it gives you a chance to really think about where you're going to take the character. The internet is a great place to start, but don't limit yourself to just one source. Being an artist means treating anything and everything as a potential source of inspiration. (Yes, sometimes that even requires going outside!) Museums, books, toys... it's all at your disposal. This piece was heavily inspired by legendary renaissance armour maker Filippo Negroli so we recommend you look him up for armour reference.

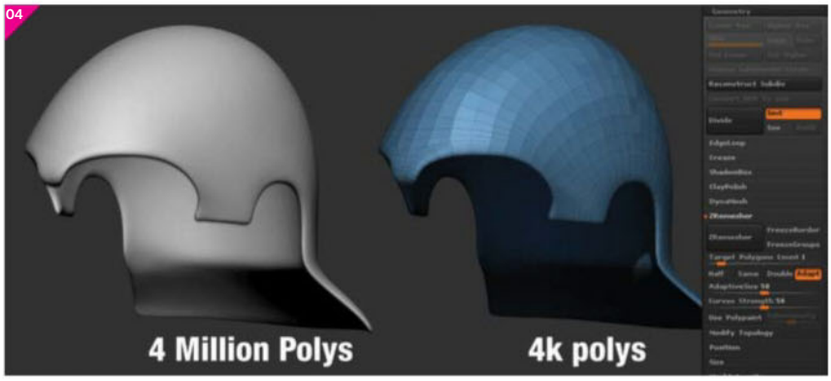

02

**02 Sculpt the head** Starting off with a base mesh, subdivide a few times and build the head using mostly the Clay brush and Standard brush. Research has taught us that soldiers weren't even allowed to reach Centurion status until at least the age of 30. So we've chosen to go with an older looking man. We assumed they spent a lot of time in the sun so we focused on giving him some lines around the eyes and jaw areas (Clint Eastwood was an inspiration for that).

### The power of DynaMesh
DynaMesh is possibly the most useful tool in all of ZBrush. It lets you turn any object into an infinitely flexible ball of clay. Simply go to the Geometry tab and hit the DynaMesh button so that it turns orange. As long as it's activated, you can push and pull geometry as much as you want and simply Cmd/Ctrl+drag in the workspace to fix any stretching.


03

**03 Create the helmet shape** The first step in creating a helmet is to ensure that you get a good base shape that you can work with. We are going to use Mask and Extrude to achieve this shape. Once you've got the base shape, scale it up slightly and DynaMesh it so that you can push and pull it into the shape that you want it to be.

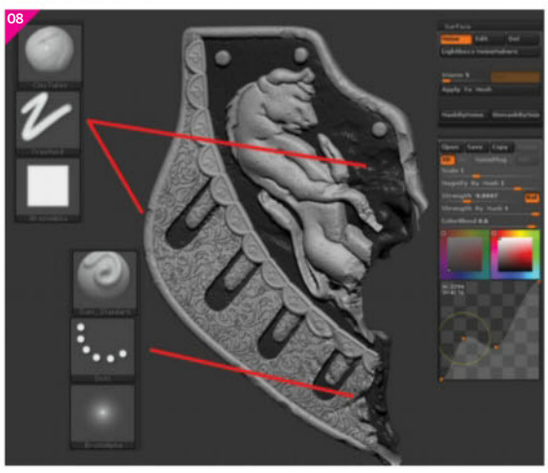



**04 Apply ZRemesher** When you have the shape you want, hit it with ZRemesher with the res set to about 1. This serves a few purposes. First, it gives you a nice clean low-poly version that you can always down res to when you want to save memory. Second, low-poly meshes play much nicer with programs like Transpose Master and GoZ.

**05 Create Alphas** We've used a wide variety of Alphas on this piece to create all of the ornate armour decoration. There are a ton of royalty-free ornate swirls and designs online to choose from. Just make sure that whatever design that you end up using is one-to-one (in a square box) and that the image is fully black and white to avoid unwanted noise or distortion.

05

**06 Apply the Alphas** With the Cmd/Ctrl key held down, switch the draw mode to Drag Rect and the focal shift to -100. Then go into the Alpha slot and load in the custom Alpha. Holding Cmd/Ctrl again, select the Alpha and drag it onto the surface of the helmet. Then do an Extract to create the helmet. You'll notice that the extraction only gives you the overall shape of the Alpha and ignores smaller details. With the piece that you just extracted, you'll notice the mask is still applied with all of the detailing still inside. Now use Inflate and Standard set at lower intensities to bring out the smaller details. Repeat this for the whole helmet with different Alphas.




**07 Use the Insert Mesh Brush** To get the ornate borders around the edges, create an Insert Mesh brush. To do this, create a simple repeatable shape – in this case, the two small leaf shapes. Make sure to keep them as low poly as possible because they will be repeated many times. Point the camera at them from the angle that you want them to lay on the surface. Then, in the brush pallet, hit Create Insert Mesh and then choose New. With the Insert brush selected, go to the Stroke tab>Curve and turn on Curve Mode. For this particular brush, set Curve Step to 0.6. Then just draw the ornate design along the edge.

**08 Weathering and battle damage**
No seasoned warrior is going to have spotless armour. These soldiers had to endure the harshest weather and countless attacks. Some well-placed damage can add a lot of appeal and realism to a character. Use the ClayTubes brush set to subtract to add chipping dents. The Standard brush with Spray mode and Alpha 08 are great for adding surface irregularity. Finally, apply a bit of noise to everything for good measure.

# Showcase

## Damon Woods

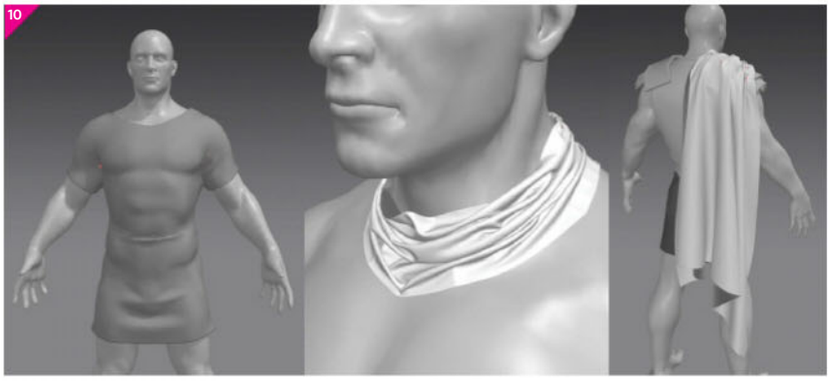
There's nothing I'd rather be doing than what I'm doing right now. Being a part of this cool little industry gives me a chance to be a part of the magic that entertained and inspired so many over the decades.

***Queen of the Sea*** **ZBrush, Photoshop (2013)**
I wanted to convey a female character who is both strong and unconventionally beautiful. The main goal was to create a believable person who looked like she had experienced a lot of pain in her life and somehow came out on top.

***Zombie*** **ZBrush, Keyshot (2014)**
A ZBrush sculpt that I did after a weekend zombie movie marathon. This decaying monster probably wasn't too nice of a guy even before he was bitten. This was my first piece rendering in KeyShot as well.

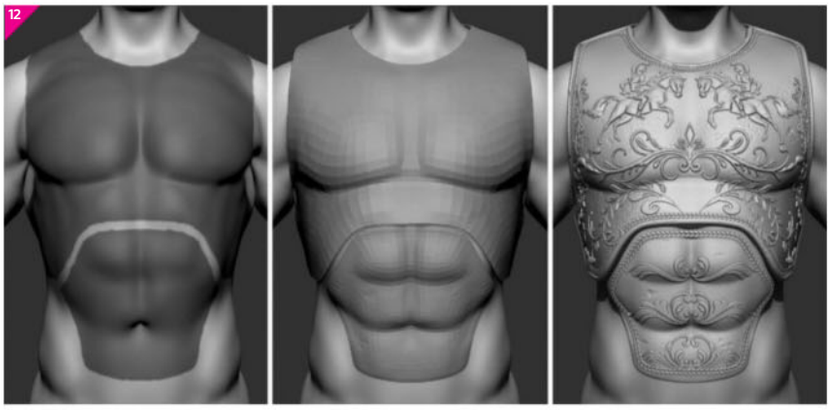
**09 Create hair with FiberMesh** Create the top head piece from a DynaMeshed sphere, then mask the area that you want the hair to sprout from and apply FiberMesh. After that, groom it a bit so that it doesn't look so perfect and new. Once again, embrace any imperfections in your work.

**10 Create the cloth** All cloth elements were created in Marvelous Designer and then imported into ZBrush. For the undershirt, it has to be pretty much skin tight to avoid penetrating the form-fitting armour. Once you have the basic shape, import to ZBrush and sculpt the smaller folds by hand. The neck scarf and cape are very simple shapes with a few carefully placed pins. Marvelous is such a great tool for creating realistic cloth and another great benefit is that it automatically generates UVs as well. This really helps out in the next step.



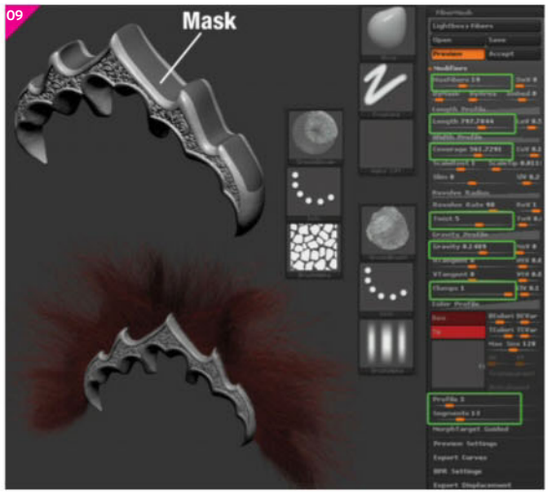

## Alternative hair option

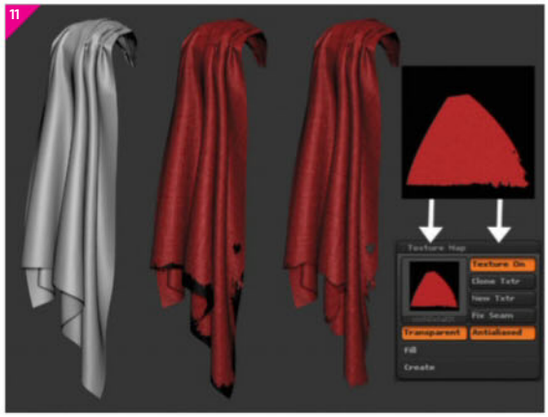
There are a lot of great programs out there for creating hair. If FiberMesh isn't getting the results you want, try using 3ds Max's Hair And Fur modifier. Instead of masking the area that you want to generate hair from, you can export the piece using GoZ, duplicate the faces in Max and then add a Hair And Fur modifier to it. There are a lot of great tools for styling the hair there. When you're done, simply convert the hair to geo with Tools>Convert>Hair>Mesh and send it back to ZBrush.



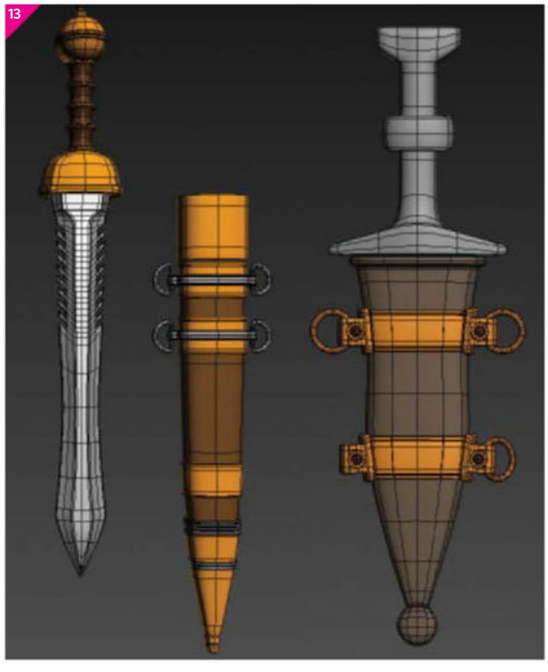

**12 Create the body armour** Just like with the helmet, use the Mask and Extract method to create the armour and to make molded body armour that supports the anatomy underneath. Use Trim Dynamic and sPolish to refine the shapes after you extract. When creating the ornate designs, choose shapes that would further support the anatomy of the soldier.

**13 Create the weapons** What's a soldier without his weapons? This is one of the most defining aspects of a warrior from any era. Artistic licence aside, it's very important to do your homework on the type of weapon that goes with your hero. You wouldn't equip a Viking with a katana or a samurai with a mace would you? In this case, the Roman warrior had two weapons, his primary being the gladius sword and his secondary being a dagger-like weapon called a pugio. We've used simple box modelling in 3ds Max to create these weapons; using image planes in order to get the proportions right.




**11 Detail the cloth** Using the UVs generated from the cloth, add some details in Photoshop. Paint in some edge tearing with pure black, and add some cloth texture as well. Then load the texture from the texture pallet in ZBrush, and turn on Transparent and Antialiasing, which turns all pure black values to transparency.

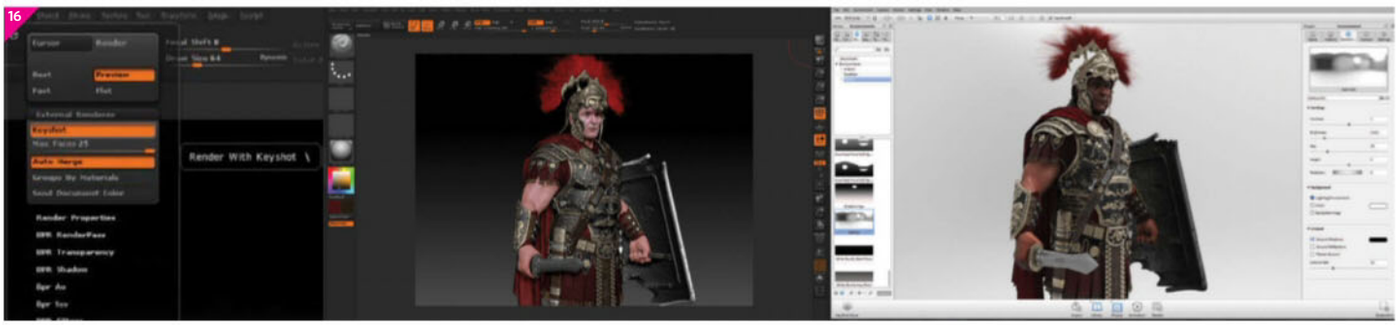


Marvelous is such a great tool for creating realistic cloth and another great benefit is that it automatically generates UVs as well

**14 Detail the weapons** After the base models are done, send them to ZBrush with GoZ. We want the sword to look used so add some chips and scratches with the ClayTubes and Dam_Standard brush. Add some ornate designs using a Standard brush with Alphas and Drag mode applied. The leather part of the sheath was created with Spray mode and Alpha 58.

**15 Apply Materials** We usually keep it pretty simple when it comes to ZBrush Materials. For this piece we've used only a handful when it comes to ZBrush Materials. The skin and leather pieces use a simple Blinn Material, the armour is Metal 01, and the Cloth is BasicMaterial. Most of the material definition is achieved from tweaking the specularity and roughness settings for each individual piece after we've exported them to KeyShot.

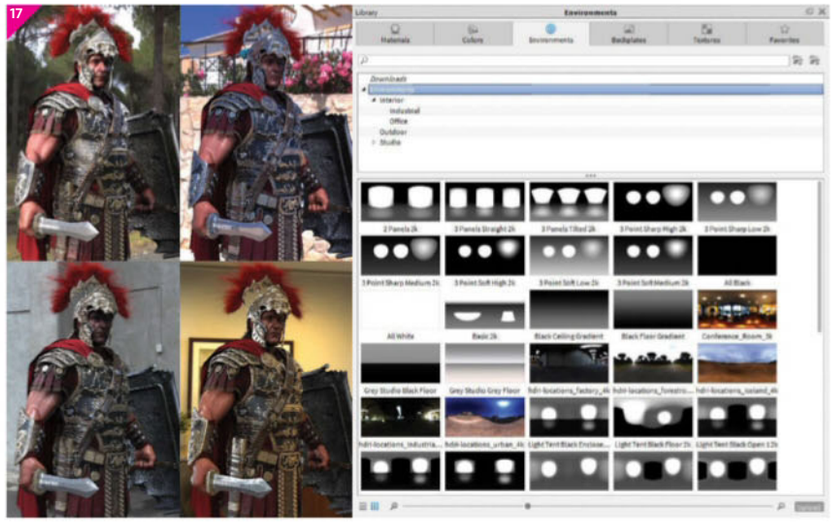
**16 Render with KeyShot** For rendering, we've decided to use the new KeyShot to Bridge feature in 4R7, which exports the model directly to KeyShot. Go to Render>External Renderer, and click KeyShot. Now, when you hit the BPR button, it will automatically open KeyShot and send over all visible subtools along with their respective materials. From here, we can make adjustments to the material settings.




## KeyShot materials

If you aren't happy with the materials that KeyShot assigns your subtools, feel free to add another from the huge library of materials built into KeyShot. Just click and drag them over the object that you want to assign it to. Hold Alt while doing this to preserve your textures.

**17 Choose lighting setup** KeyShot has a variety of IBL (Image Based Lighting) environments to choose from. You can find them in the Environments tab and you can switch between them by double-clicking the thumbnail image. Adjust the lighting effects in the Settings panel to get the results that you want. To render a final image, hit Cmd/Ctrl+P or click the Render tab at the top. Here, you will be given some options before rendering the image. Just hit Render whenever you're ready! Congrats, you're done!






All tutorial files can be downloaded from: **filesilo.co.uk/3dartist**

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**GEORG-SEBASTIAN DRESSLER**
*Venice,* 2015

### Software
Maya 2015

### Learn how to
- Create a set of rules
- Efficiently model core assets
- Use UV tiles to lay out the structural elements UVs
- Reference elements and combine namespaces
- Speed up the build process with a MEL script

### Concept
The goal for this tutorial is to understand and apply a modular concept to create and adjust a multitude of different buildings sharing the same pool of structural elements.

**YOUR FREE DOWNLOADS** from **filesilo.co.uk/3dartist**
- Tutorial screenshots

# Modular background buildings in Maya (Part 1)

## In the first part of our tutorial, learn how to use modular assets to create different houses and save time

Creating a believable, detailed background environment can be a tough task. But this is not because you have to create detailed and appealing elements, rather it's because you have to produce lots of these elements with a good amount of diversity.

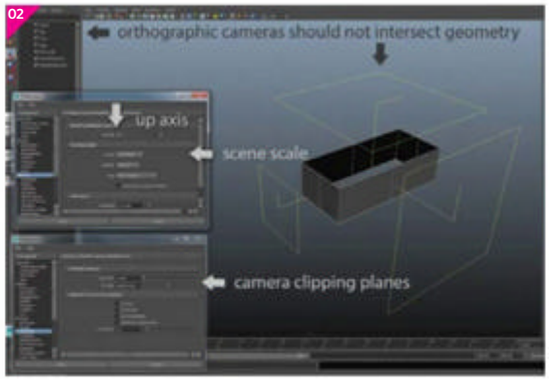
Not every digital artist is able to create 3D based-matte paintings, and of course you want to have flexibility when it comes to changing cameras and picture composition too. What you are looking for is the possibility of creating modular assets that you can put together to build bigger assets, such as houses, to fill your backgrounds. This tutorial will explain a concept that enables you to build an example house following a set of rules, workflows and a handful of assets including doors and windows. The way that we are working means that you will have to be organised as this workflow is not very straightforward.

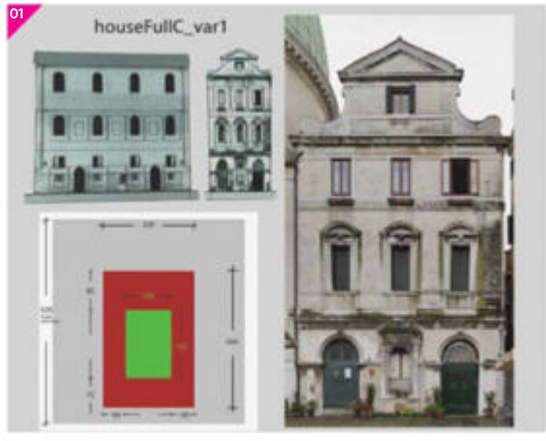
By creating the less complex assets first, it makes it easier when assembling the house later. By adjusting some of the key aspects of the assets, like size, shape and positioning, you can easily create new assets for building different houses or switching and adding these to already existing builds. Referencing these assets will help maintain flexibility while working on the model.

After cleaning up and importing all of the assets, we save the file for the shading, lighting and rendering process, which will be the topic of next issue's tutorial. There is a lot to cover – be sure to use the provided Maya project and video tutorials available on **FileSilo.co.uk** after Part 2 next issue.

**01 Style reference and rules** For your first step it is very important not to mix up different styles of houses as it can be difficult to bring them together. Collect material for whatever you want to build. In this example we will create houses in a Venetian canal. Define structure assets like basement<floor1<floor2<floor3<roof. This means the house will include at least one basement, one floor and one roof. Then define the insert assets: door=big window>small window. This means that each floor includes one or more assets that consist of a door, a big window or a small window.

**02 Set up the Maya environment** You will work on a real-world scale, so in Maya set the scene scale preferences to one unit=one centimetre and the camera up axis to y. Be sure to set the camera near and far clipping plane preferences to 1 and 10,000 units to avoid the objects being cut off. If you get in trouble with the orthographic cameras, check if they are intersecting with objects. All assets that will be created should be saved in the Assets folder inside the Maya project that you have downloaded from FileSilo. From there we will reference them in the assembled Maya scene.

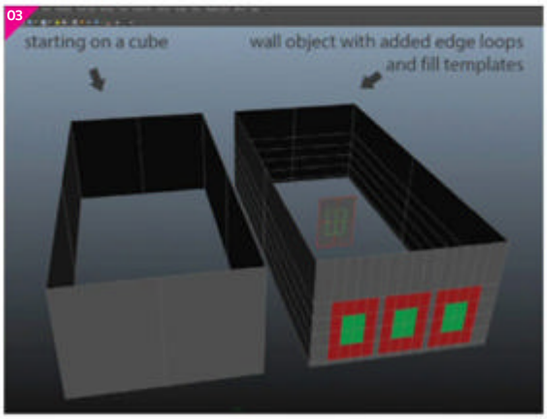


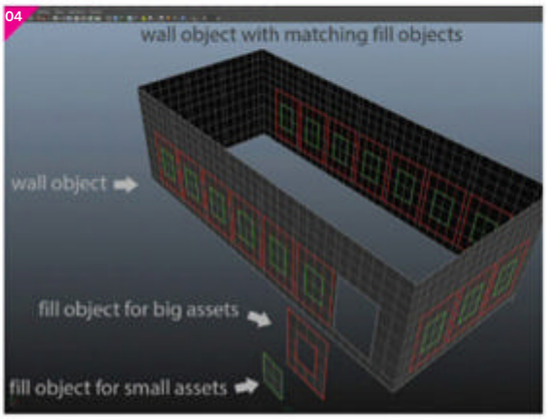

### Using the provided material
Although we've tried to explain a simple version of a modular system with several Maya scenes and references, it is still a complex topic. With the provided Maya project on FileSilo, you will find a tutorial video for most of the steps. You can also find all of the asset files that you will need to assemble the example building as well as finished Maya files that are needed for every step. Be sure to check out next month's issue for part two of the tutorial, and for access to all of the free resources.

> "Be sure to set the camera near and far clipping plane preferences to 1 and 10,000 units to avoid the objects being cut off"

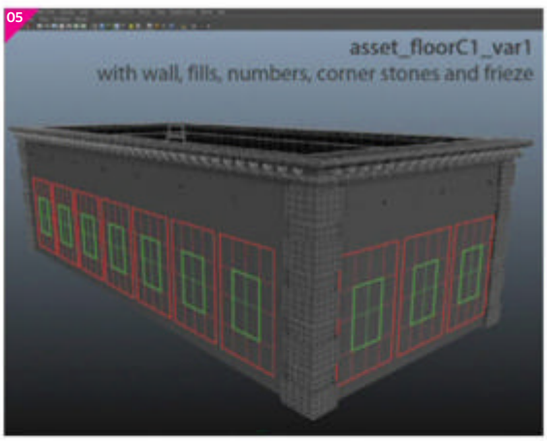
42 PAGE
PIPELINE
SPECIAL



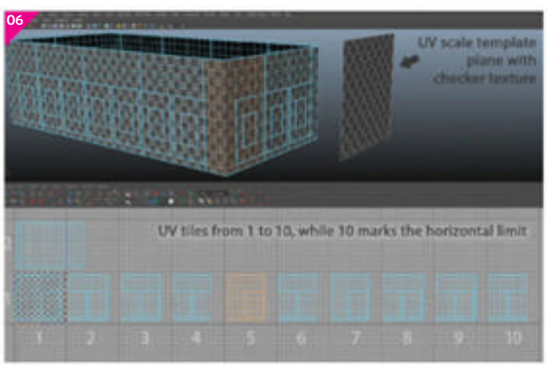

**03 Start with the first floor** Create a polyCube with 800 by 525 by 1,800 units. Set the cube's subdivisions to 2 in x and z. Delete the top and bottom faces. This is the wall object. Create a polyPlane 200 by 300 with subdivision set to 2 and another polyPlane 150 by 200 with subdivision set to 2. Now group up the planes. These two planes represent our door and window assets. In the front view, add and align loops to the wall to match the planes edges first horizontally, then vertically. Reposition the planes group to 225 units left and right, and add edge loops for two positions for inserting doors and windows.



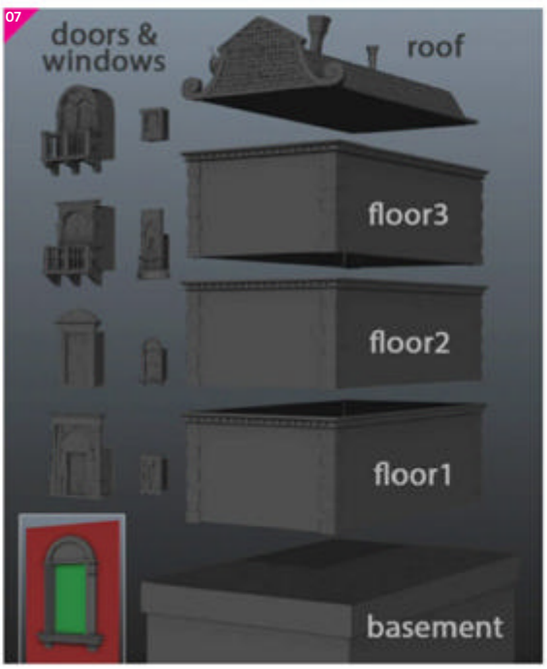

**04 Create wall geometry** Rotate the planes group by 90 degrees in y and add seven positions for inserting doors and windows to the wall's side. Delete the back and side geometry, and use mirror geometry to copy your work over. Add as many loops as needed to get face sizes as equal as possible. Then select all new faces created, except for the ones on the back, extract them and delete history. Select all of the newly created objects, except for the wall, and combine again. Now delete history and separate that object. We created the wall with matching fill objects for inserting doors and windows.




**05 Finish the first floor** Put centre pivots on all objects and group them to GRP_wall and rename them "GEO_wall" for the framing wall, "GEO_innerFill(1-17)" for the small fill objects, and "GEO_outerFill(1-17)" for the big fill objects. Now group GRP_wall four times for this hierarchy: GRP_MAIN>GRP_GEO>GRP_placement>GRP_floor>GRP_wall for all assets. In Display>Drawing Overrides, change wireframe colours like the wall to grey, innerFills to green, and outerFills to red. You can add annotation numbers for every fill object. Now position the pivot from GRP_placement with point snap to the most front-lower-left vertex of GEO_wall. Save the file to the assets folder as "asset_floorC1_var1.ma". Use this naming convention for all created assets.



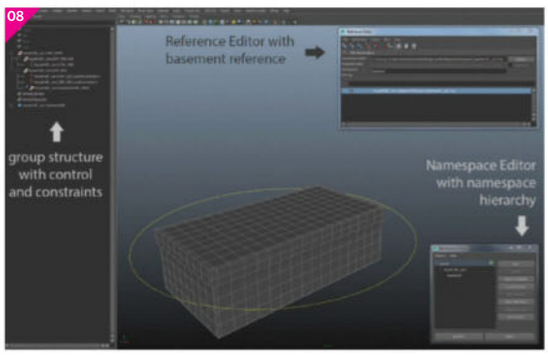

**06 Create the UVs** When creating the UVs of your assets, use the same scale for all objects in all assets. Use a UV checker textured plane that is referenced to all assets to keep the scale consistent. This is important for the shading process later. In all provided assets you will find UV tiles. Their numbers are limited to one to ten (left to right) and they start again once it reaches ten. Please check the provided asset files and videos for clarity.



**07 Basement, roof, windows** When creating the additional assets, use the same group structure like the one for floor1. Reference asset_floorC1_var1 to Maya to ensure correct scaling and position. For the basement, make sure you have a good mesh equality for displacement shading. Use the template planes created in Step 3 for scaling reference when creating the doors and windows. For these assets, create and fit the frame object to the templates first before building other stuff, like any shutters, ornaments or windowsills.

Here lots of houses have been created with the modular assets concept

> When creating the UVs of your assets use the same scale for all objects. Use a UV checker textured plane referenced to all assets to keep the scale consistent

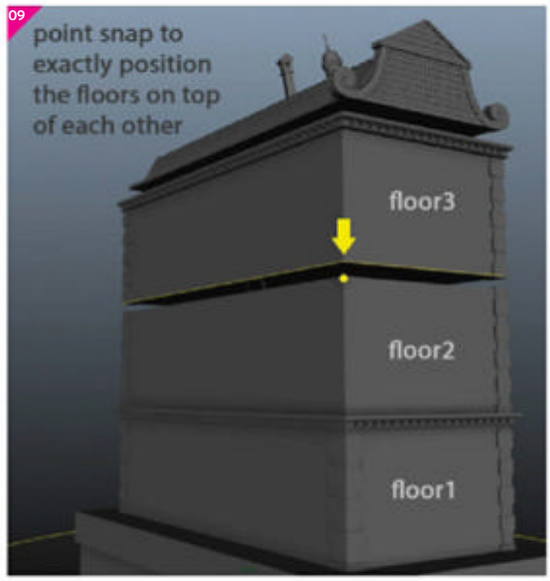

08
Reference Editor with basement reference
group structure with control and constraints
Namespace Editor with namespace hierarchy

## Create new assets out of existing ones

When creating additional assets, be sure to reuse as much content from the already existing ones, or use them as starting points. As the models of the single asset files are not too complex and follow the same style, it's easy to change and modify them. For example, create the second floor by starting with the first floor model and only changing the height of the fill objects. The item _var1 in the created assets means 'variation'. The capital letter C stands for general dimensions like 800 by 525 by 1800 for a floor. Utilise these conventions to create different builds and variations.

**08 Start the assembling process** Start with a fresh Maya scene and set it up like in Step 2. Create a new namespace called "houseFullC1_var1" and set it as the current namespace. Now everything we create will have that namespace. Now reference asset_basementC_var1. In the reference editor select the namespace houseFullC_var1 and use the string 'basement' for the new reference. Be sure to switch off Shared Nodes. Now create the group hierarchy: GRP_MAIN>GRP_MSR_RIG. Create GRP_GEO and parent it to GRP_MAIN. Parent the referenced basement asset group to GRP_GEO. Then create a yellow nurbsCurve CTRL_MSR as a control, and parent it to GRP_MSR_RIG. Create a parent and scale constraint from CTRL_MSR to GRP_GEO.

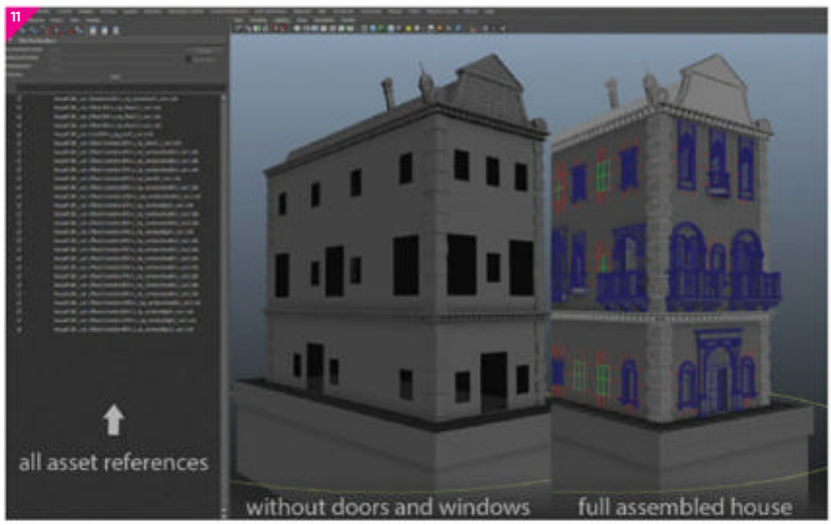
**09 Add assets** Add the next reference asset_floorC1_var1 with the namespace floor1. Select houseFullC_var1 again to define it as the new reference's root namespace. Use GRP_placement from the floor1 asset to position the floor on top of the basement and add the second floor with the namespace floor2. With the pivot set right, position the GRP_placement of floor2 with point snap exactly on the most front-upper-left vertex of floor1. If you are having snap problems, hide the cornerstones and frieze groups. Repeat this to add the third floor and the roof.

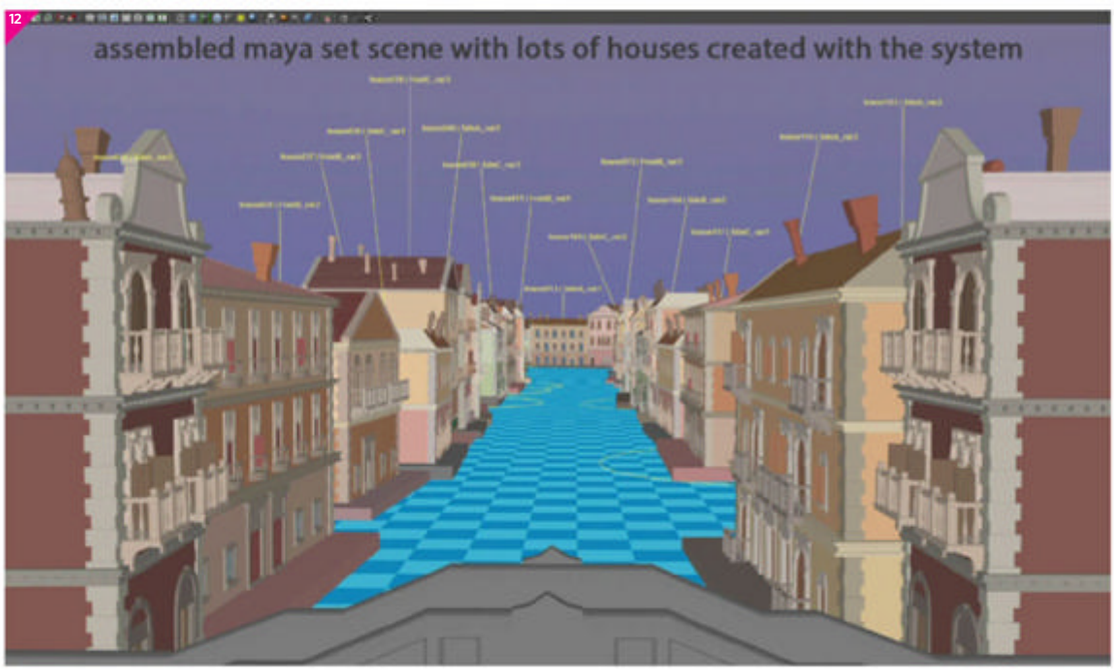



**10 Add window and door assets** When you've decided where to add any doors and windows, start with the first floor and hide the fill objects that are located where you want to place an asset. Now reference the asset like in Step 9 with the namespace window1, window2, and so on, but this time select floor1 as the parent namespace. A proper combined namespace should look like this: 'houseFullC_var1:floor1:window1:'. Reference and position all assets to their 'holes'. The provided video uses a simple MEL script to speed this up. Discrete Rotate with 90 degrees makes positioning the assets easier. Save as "build_houseFullC_var1".

**11 Clean and prepare for surfacing** When you are happy with your build, use Reference Editor>File>Import objects from reference to dissolve the references, but never ever delete the namespaces. These namespaces are used to create unique names for all objects. With everything imported, search the outliner for unused nodes, like defaultLayers and sceneScriptNodes, and delete these. Save the clean scene as: "asset_houseFullC_var1".

**12 Add more** This is not the end of the system. If you have additional props like pipes and plants, you can create them in the same way as windows and doors. With a little MEL scripting, there are ways to bring asset positions and rotations out of order by randomising. The consistent asset group structure and the namespaces create simple scripts. There are scripts provided with the tutorial. At Morro Images an automated tool is used to make a house in under ten minutes.




## Working with namespaces

Namespaces can be tough. Here are tips that may help. In Maya go to Windows>General Editors>Namespace Editor. Here are all the namespaces, either from references or imported files. Be sure to delete them all, clean up the structure and then insert asset files. When creating references, use a string like 'basement' or 'floor' instead of the filename. It keeps the reference consistent, even when you switch files underneath. You can use a script for referencing and end up with less mistakes than in manual referencing.

All tutorial files can be downloaded from: **filesilo.co.uk/3dartist**

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# Create a convincing cartoon character

## Render a charming cartoon pin-up, prepare a hairstyle and complement a scene with organic ornaments and lighting

**CARLOS ORTEGA ELIZALDE**
*Green Morning,* 2015

### Software
Maya, Mudbox, Photoshop

### Learn how to
- Create an appealing cartoon character in basic steps
- Make a graceful silhouette
- Create a custom hairstyle
- Set up a lighting rig to showcase the model
- Finish the basic image in Photoshop using passes from mental ray

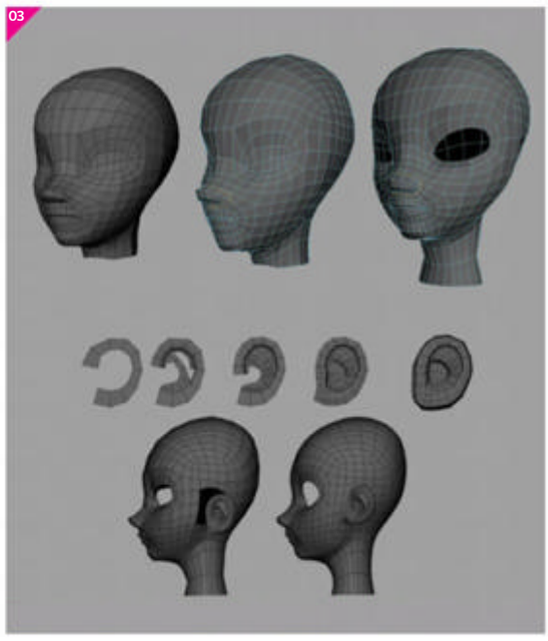
### Concept
I've always loved the elegant mix of organic ornaments and fabrics that are frequent in the art nouveau style, this was in part inspiration for this piece, which started out originally as a quick sketch.

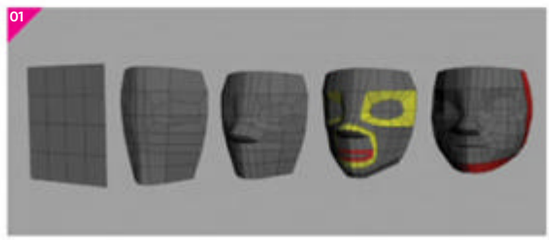
**YOUR FREE DOWNLOADS** from **filesilo.co.uk/3dartist**
- Scene files including lighting setup
- Tutorial screenshots

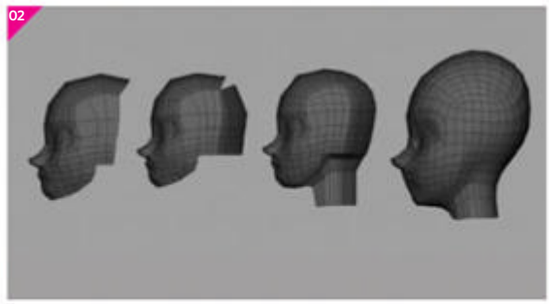
This tutorial covers a basic workflow used for creating a female cartoon pin-up, it covers areas such as a basic way to start a model and important ones such as creating hair. While there are tons of different methods, here we show you a quick and flexible way to define a hairstyle without worrying too much about technical aspects so you can focus more on the shape, silhouette and other creative aspects. We will work with Maya, Mudbox and Photoshop, but most of the technical aspects and all of the artistic parts can be done in any other equivalent software.

**01 Model the head** Starting with a 4x4 plane we start by creating the edge loops that will become the main areas of the face, such as the eyes, mouth and nose. The eye sockets are just circular extrusions and the mouth consists of two circular extrusions: an outer one going around the mouth up to the nose bridge area, and an inner extrusion that will become the mouth and lips. At this point it is useful to have a sphere to serve as an eye placeholder – it will also help us to build and define the eye sockets around it.

**02 Close the head** By extruding the border edges of the sides and the bottom of the head we will get the polygon flow that will define the jawline. Now extrude the edges of the sides and the top to the back of the head, this will leave room at the bottom to extrude the neck. You can close the head by extruding the edges of the back and merging the vertices to the top of the head – just think of the shape as a smoothed cube. Then extrude the hole in the bottom of the head to create the neck. Using the Sculpt tool, smooth the new edges to get a round shape.



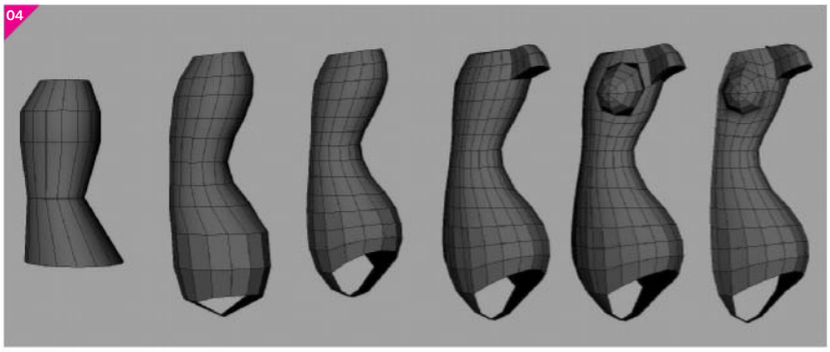



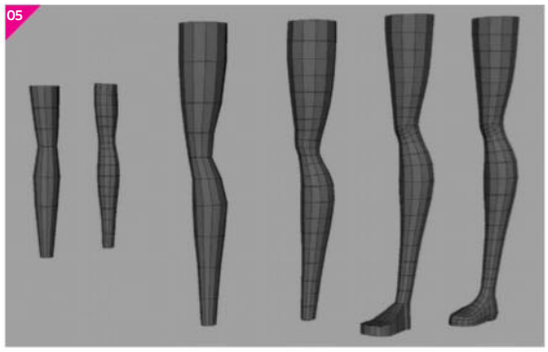




**03 Model the nose and ear** We create the nose by adding a face loop in the nose area. The ear is modelled in parts, starting with a simple row of polygons shaped as a spiral section. We don't need a fully detailed ear for this character – modelling a simple, suggestive antihelix and the inner ear is enough to get believable cartoon ear. By deleting some faces on the head and leaving the same amount of edges in the hole and in the ear border, we can attach it to the head using a Bridge operation.

### Take control of every vertex created
A common error is trying to get a lot of detail from the start, if you get the shape of the head you want with a small amount of geometry and a smart topology it becomes easier to predict when and where to add or delete new edge loops. That being said, don't be afraid to add new edge loops for further detailing without the fear of losing the shape you already had. Tools like Edit Edge Flow, the Slide Edge Tool and the relax and smooth operations in the Sculpt Geometry tool are really powerful for smoothing out an organic, dense mesh.

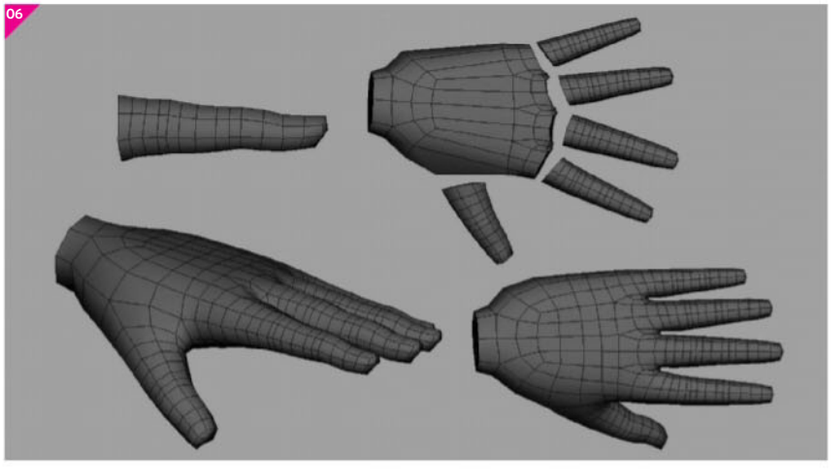
> If you get the shape of the head you want with a small amount of geometry and a smart topology it becomes easier to predict when and where to add or delete new edge loops



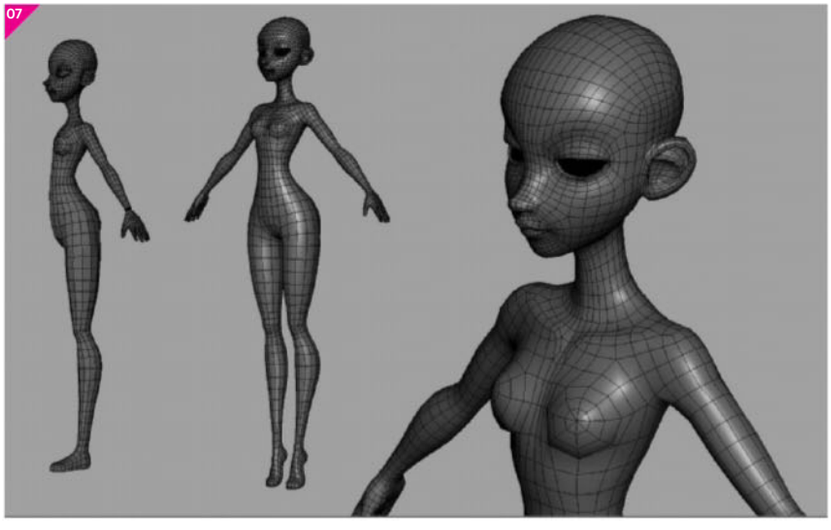




**04 Build the torso** The main shape of the torso is basically a cylinder. With a few divisions we start to block the base of the neck, the shoulders, the waist and the hips. With those areas defined it's easy to start adding divisions to the rest of the piece, as well as extruding the shoulders. The breast area is just a section of a 8x8 sphere attached in the front, slightly below the shoulder's height. We close the bottom area by creating a bridge with the central edges in the front and back, this will leave the holes for attaching the legs later.

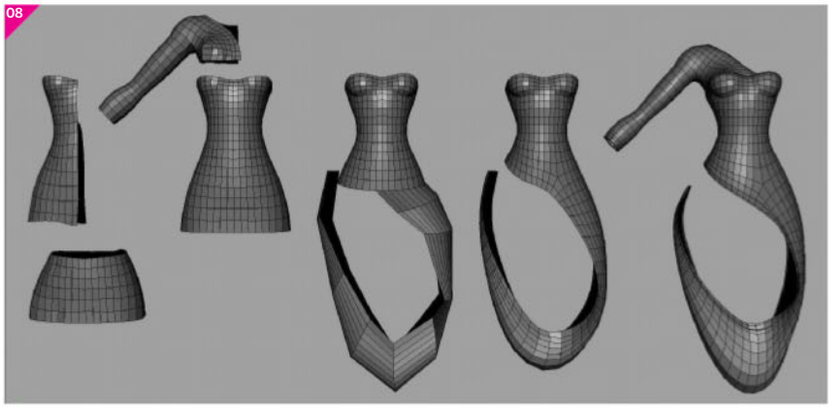
**05 Build the arms, legs and feet** The arms and legs are cylinders too, but with the edges extruded. The main areas and widths that we want to define here for the arm are the biceps, elbow, forearm and wrist; and for the leg the width of the thigh, knee, calf and ankle. For both parts always check from both views to get the desired shape. Once we have those sections blocked we can start detailing by adding more divisions. The foot in this case is created by closing the bottom of the leg and extruding the front faces, we don't need toes since our character will have shoes.



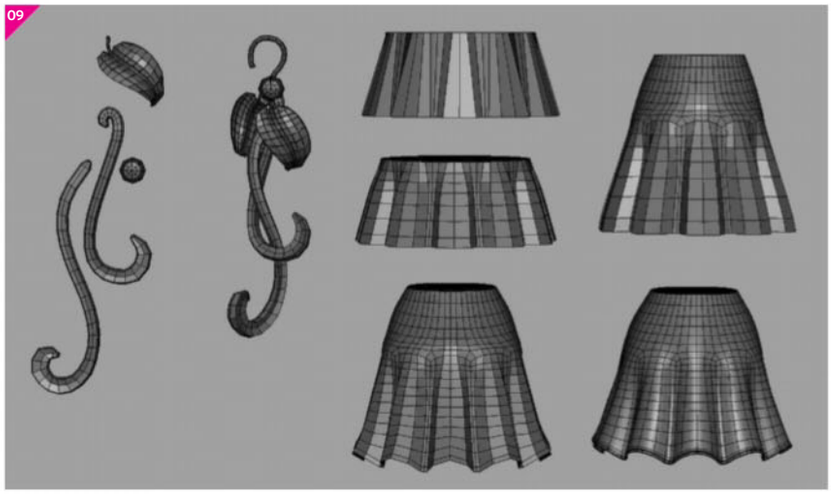

**06 Model the hands** Starting with a cylinder we create a base finger. The palm can be started from a cube with enough divisions for attaching fingers later. It can come in handy too, when adding the skin, to leave space between each finger. Duplicate the finger and place them around the palm, scaling each one to its proper size. Then attach each finger to the palm, using a Bridge or the Merge Vertex Tool. The base topology is really basic, so focus more on avoiding a blocky shape by sculpting or tweaking vertices using a soft selection.

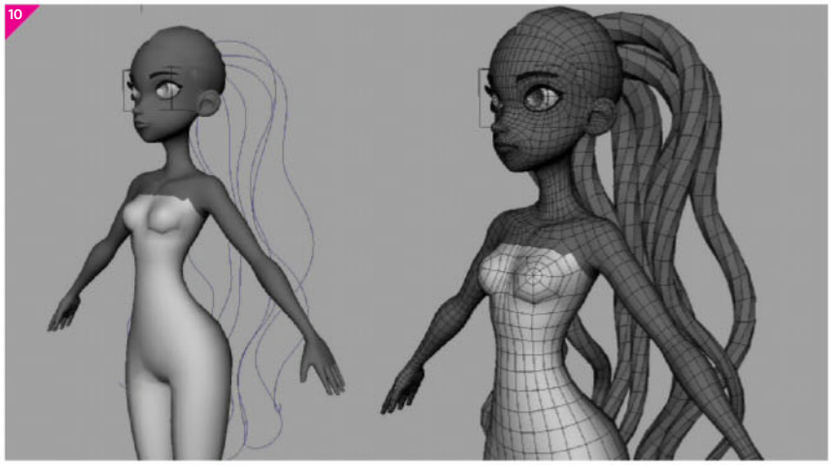



**07 Merge the pieces together** Attach all the limbs to the torso, and smooth out the joins if needed. Add some clavicle detail on the body since it is a part of the body that will not be fully covered by cloth. For the final eyes we start with a sphere, extruding and sculpting the bulge on the front that is useful to catch highlights pleasantly. The iris and pupil is just a concave disc placed inside the outer eye, by using a transparency map it will enable us to see through the cornea inside the iris.




**08 Make the dress** We create the dress by using a duplicate of the body, this way we will make sure it will fit with no major effort. The upper part of the dress uses the geometry of the waist up to the shoulders, and the skirt itself will come out of the hips' geometry. Once extracted, we need to get rid of the breast details and close the dress more naturally. The cloth extension is just an extrusion of the bottom half of the dress, going back and up to connect to the opposite side of the dress at the hip's height.




## Plan the hairstyle

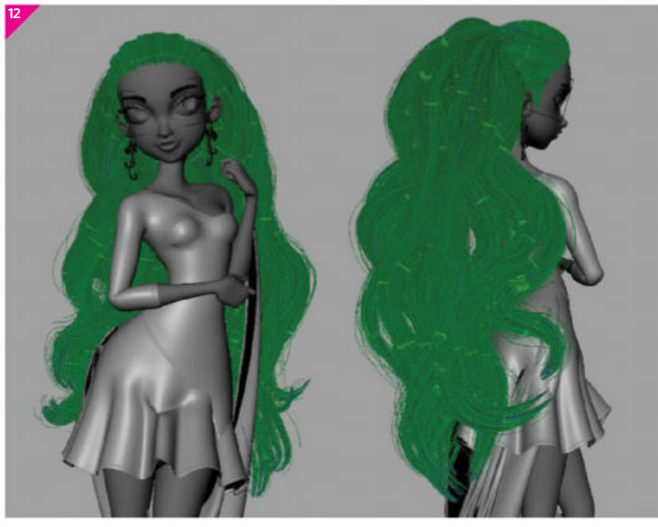
You can easily block the hair geometry using polygons by thinking of hair as broad shapes or clumps instead of hundreds of individual elements. By keeping a 'grid' or 'patch' topology on the geometry of the strands, it can lead to different styles of output depending on your needs. You can use the geometry to get an appealing cartoon look, use transparency and bump maps to get a more detailed look, or create curves from the geometry to grow a more complex and dynamic hair system.

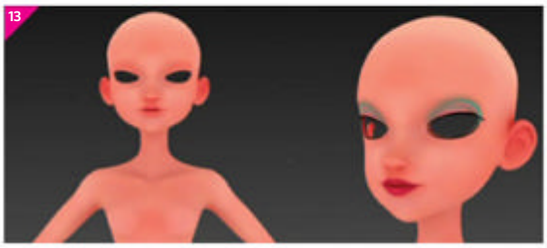
**09 Add the skirt and accessories** The skirt is created in two parts, the folds can be easily created by using a cylinder and pulling out vertices to create the folds. After extruding and shaping the bottom part of the skirt attach it to the hip's geometry that was previously extracted from the body. The shoes are created using geometry from the feet, and then building them around the foot. For things like earrings and hair ornaments, model the elements and then combine them to create each accessory, this adds a consistent style by having repeating patterns across the model.

**10 Build the hairstyle** The hair here is divided into two parts – one covers the skull and the other is formed of long strands in the back. For the calvaria we can start with a sphere and delete the poles to easily get the basic strand shapes coming from the forehead to the back of the head. Keeping the topology as grid patches is pretty useful for converting later to a Maya hair system. For the long strands of hair in the back draw the main shapes using CV curves. Then, build eight blocks of hair by extruding a circular plane along the curves.

**11 Detail the hairstyle** Use the taper and twist functions in the Extrude options and sculpt the resulting mesh to get variations in volume and shape. Now extract the curves that will serve as guides for the hair. Select the Edge Loop and go to Modify>Convert>Polygon Edges To Curve. You will need to do this for all the necessary curves. There are free scripts on Creative Crash that can automate this process. Too many curves can lead to a heavy system and too few curves can force you to grow wider clumps with lots of hair to fill the gaps, and this will hence lose the silhouette of your hairstyle.

**12 Finish the hairstyle** Next step is creating two hair systems, one for the head and another for the long strands. Select the head curves and go to nDynamics>Hair>Assign Hair System, then assign a PaintFX brush to Hair. Now you can adjust the clumps' width and shape, hair thinning, number and width of hairs per clump, and hair shading. Keeping the original mesh of the hair without deleting history in the curves lets you modify the polymesh directly to tweak the hair and transfer those changes to the hair system. By default the hair gets dynamic properties, and you can change it to static for a still image like this.



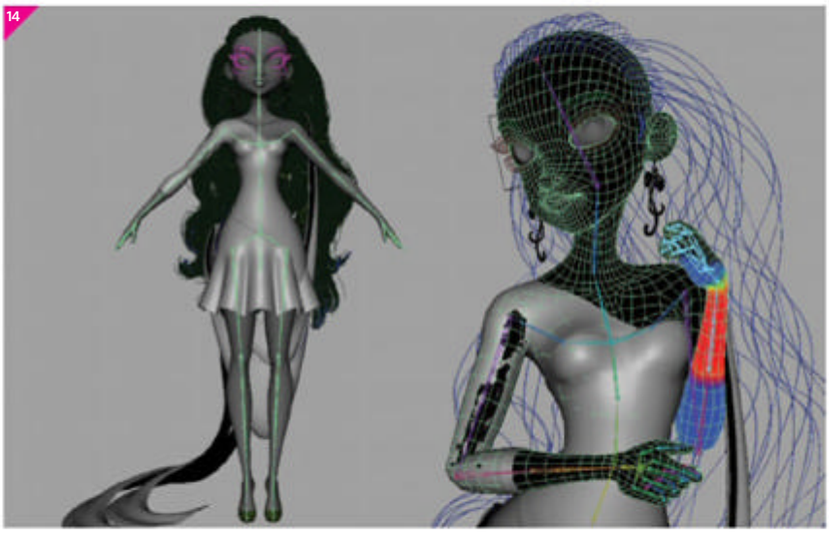


13 **UVs and texturing** The improved unfold tools in Maya will let you unfold the body and cloth meshes easily, one UV tile per material will work great for this model. Moving to Mudbox, paint the textures of the character. You can start with a skin colour base and add yellow, orange and pink tones in the nose and ear areas, and purple tones in the eyes. Using references is a good way to know where those tones suit better. Now paint more maps such as a deep Scatter, Specular and Glossiness map. We will plug those to our skin material.

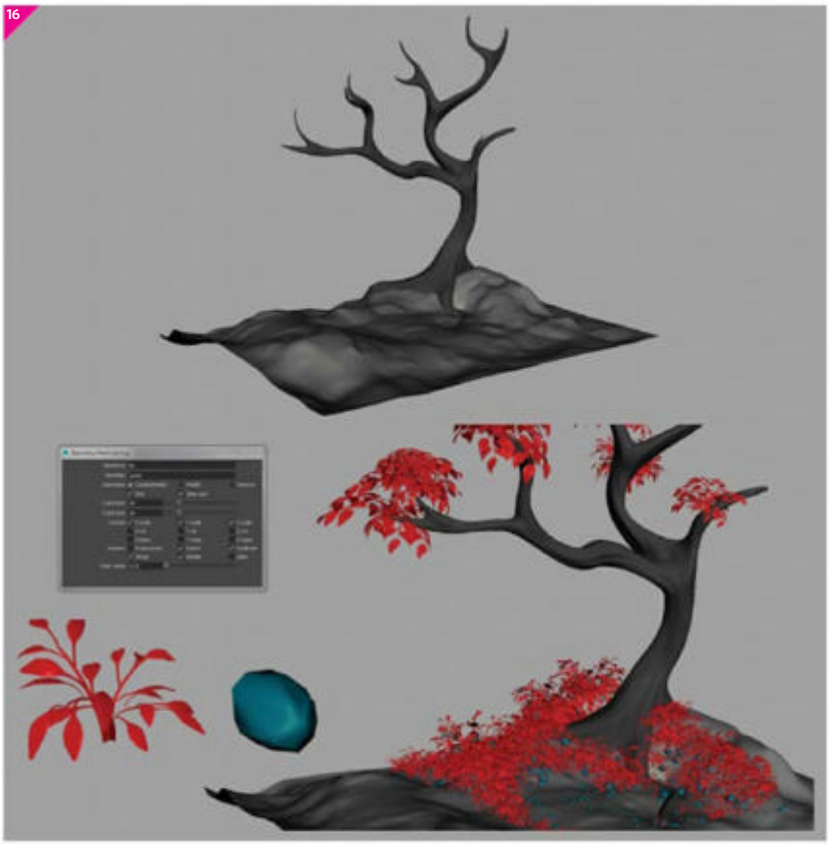
## Getting a graceful silhouette

Learn to observe everyday life and how the human body acts, balances itself and moves so you can start to create natural and balanced poses that pushes limits in a believable way. Here, the shoulders tilt in the opposite direction to the hips to compensate the weight. The pose is almost an S shape, something playful and flirty yet balanced. Along with the flow of the shapes of the dress, it can help you to get a solid composition and guide the viewer from the face, down to the fabric on the ground.

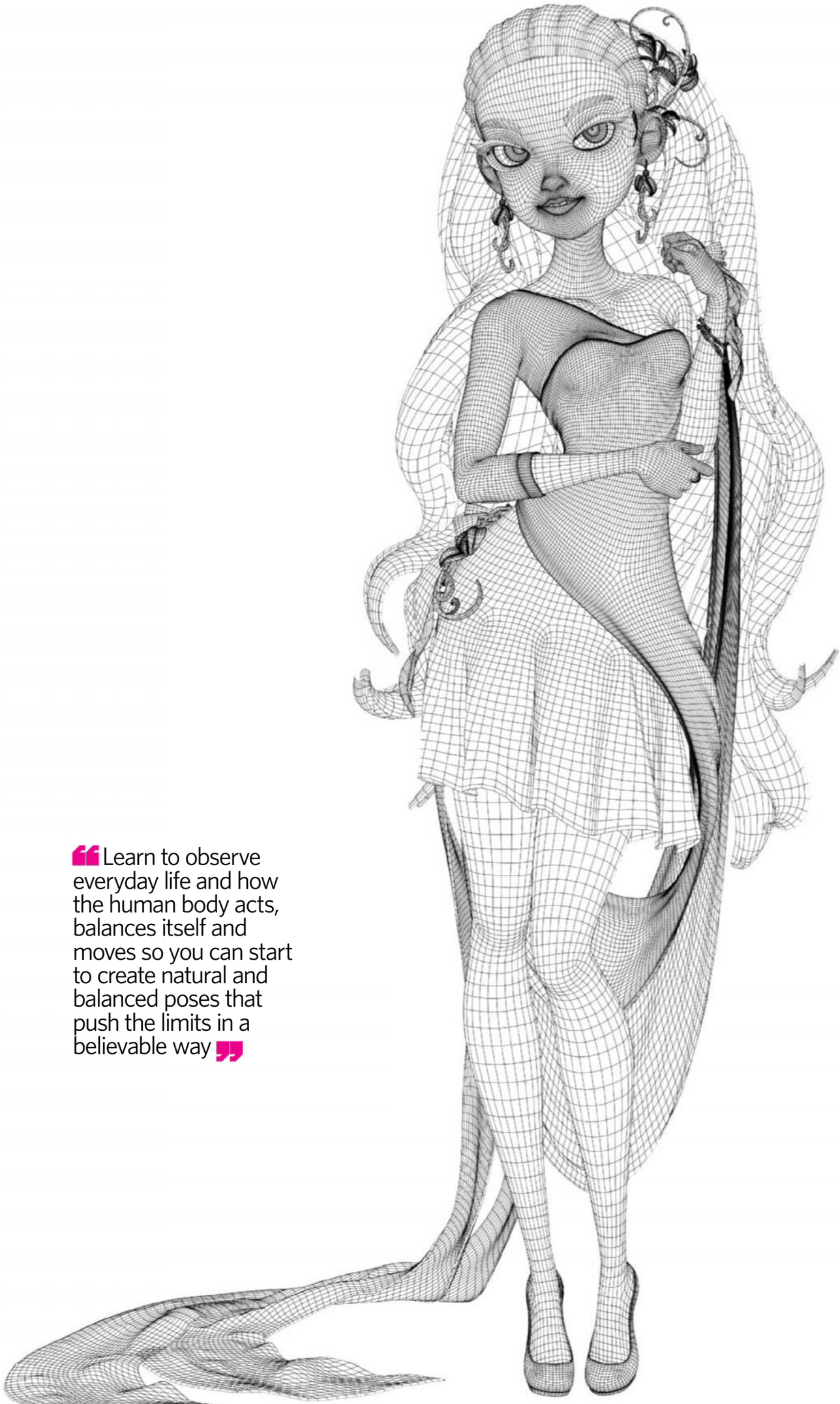
15 **Detail the model** Once posed, send the character and dress to Mudbox for detailing to fix the weighting and volume loss for a more natural bending in the elbows, fingers, neck and knees. We subdivide the dress a couple of times, sculpt the foldings in the fabric and fix interpenetrations between elements. Most of the silhouettes of the objects were solved with pure polygon modelling, so at this point, bake some normal maps of the cloth to get all the folding details. Then export all the elements with one level of subdivision to save some render time and avoid the use of displacements.



14 **Pose the model** Create a basic skeleton in Maya, drawing the joints from the hips up to the tip of the head, then legs and arms. Using the Snap to Projected Center feature will enable you to easily create the joints in tricky areas such as inside the arms and fingers. We bind the skeleton to the main mesh using the Heat Map option and Quaternion method, and since it is a skinny character this option works well by default. We can then skin the clothes and copy the influence of the body to the dress.

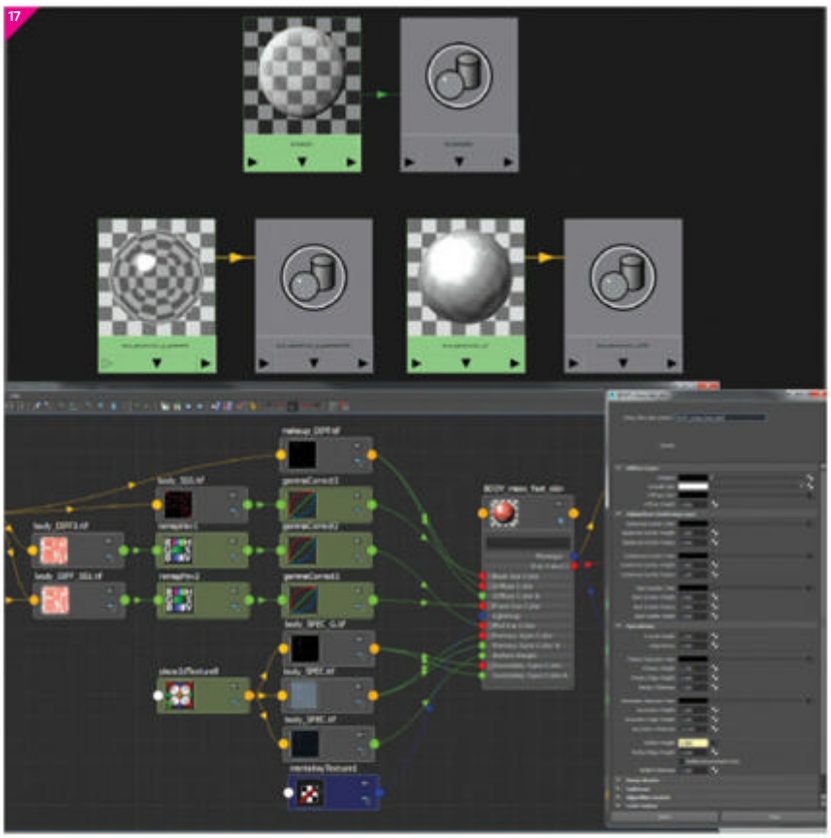


16 **Lay out the scene** To complement the scene we will add some natural elements that will suit the atmosphere and colour palette. We will add a simple terrain which we can sculpt and detail in Mudbox. The tree can be quickly created in ZBrush – we don't need to overdetail the model, since the whole feel of the scene is smooth and more like a fake set rather than a realistic scenario. To fill the ground with details we use the Paint Geometry Tool which you can find in Maya Bonus Tools 2015. Its ease of use will let you quickly grow some plants and throw some rocks on the ground.



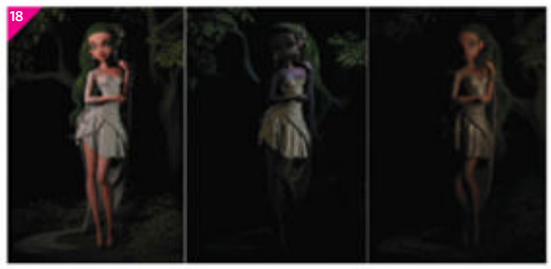
> Learn to observe everyday life and how the human body acts, balances itself and moves so you can start to create natural and balanced poses that push the limits in a believable way

**17 Materials in mental ray** This scene uses the mia-material-X, the misss-fast_skin shader and blinn materials. It is useful to start playing with the Scale Conversion option on the skin shader to make it work, since the shader will depend of the size of your object. Plug the textures and be sure to gamma-correct each texture or work your scene with the Color Management option. The fabric material uses some ramps to define transparency and colour, so that it gets more transparent and is at a glancing angle. Use glossy refractions objects, which will become blurred when seen through the fabric.



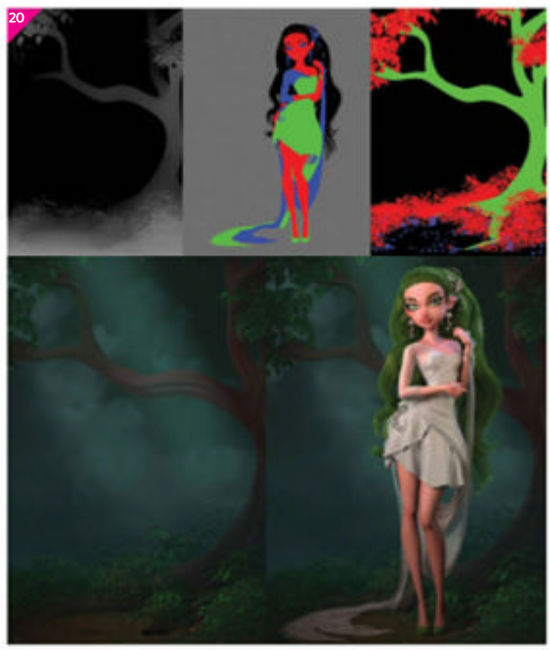
**19 Rendering** The scene is rendered with mental ray and Final Gather. For large resolution renders like this, it's useful to bake a Final Gather map at a lower resolution and then freeze it to save some render time. By default the skin shader takes into account the resolution of your scene to compute its light maps, be aware of this when doing large tests or final renders. For the same reason, we will render the scenario and the character in separate render layers using a 32-bit EXR format.

**18 Lighting** The light rig consists of four lights: key light, (spotlight) which gets most of the volumes and defines the main source of light; backlight (spotlight) to get some highlights on the hair on the left side; bounce light (arealight) to fill black areas; and environment light (IBL), which is set to a very low value – it fills the whole scene and casts reflections on the objects with a free blurred HDRI.




## Be curious with the attributes

It can take a while to get a decent look with materials like the skin shader. A suggestion for this kind of cartoon character is to not look for realistic results or fixed recipes of values. Be curious, take your time to do various render tests with default settings and analyse every value by turning it off or changing its value to see the effect on the material. Try to be a good observer of real-world materials so you can replicate them in the future.




**20 Finish the image** Some useful layers to render during image compositing are a good set of masks, a depth pass and in some cases a normal pass. In Photoshop, use the depth pass, and add atmospheric elements such as fog and depth of field (using the Lens Blur filter). The masks are useful for adjusting the colour or exposure of different elements without struggling with selections. We can create light effects by painting with soft brushes and setting layers to a Screen or Add mode. The dust particles are just brushes with high scatter values and different blur settings for a feeling of depth.

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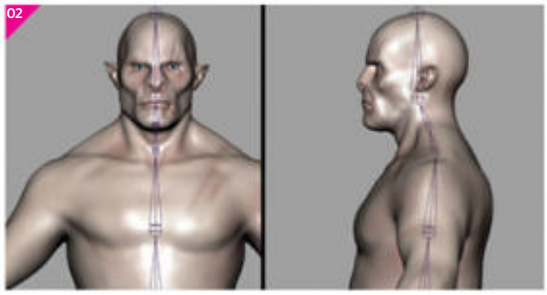
42 PAGE PIPELINE SPECIAL

# Pose a sculpt using joints

When creating a sculpt, building it up in a generic T-pose usually simplifies the sculpting process, and among many things helps to ensure that all the limbs are in proportion. However, this also makes for a stiff-looking character. In this tutorial, we'll look at how you can go about adding a bit more life to a sculpt whilst still being able to go back to the default T-pose, as that is how you would want to pass the model should it need retopologising and rigging for animation.

Now there are many ways to pose a sculpt. For example, in Mudbox you can add joints and use falloffs; in ZBrush you can use Transpose or a ZSphere rig. The preferred method here, however, is to take the lowest resolution of the sculpt into a 3D package – in this case into Maya – and take advantage of the rigging tools. Although the set-up time for creating the initial skeleton and then binding the mesh to the skeleton may be slightly longer, once complete, you can create a wider range of poses more quickly than if you were using the default posing tools in Mudbox or ZBrush. Hopefully by the end of this tutorial, you will have another workflow that you can add to your arsenal of tools.

**01 Export the sculpt** The first thing we need to do is send the sculpt to Maya. In Mudbox take the resolution of the sculpt and the costume down to its lowest level. Next, in the Object List, select the sculpt and the costume meshes, and go to File>Export Selection, and save this as an FBX file. Now jump to Maya, go to File>Import, and load the FBX file. If you cannot import an FBX file into Maya, it's probably because the plugin is not loaded. If that is the case, go to Windows>Settings/Preferences>Plug-in Manager and enable fbxmaya.mll. Jump into the Outliner next and make sure everything is named accordingly, select all the geometry, group it together (Cmd/Ctrl+G), and rename it to "orc_geo_grp".

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## 02 Create a joint chain for the spine, neck and head joints

Now that we have the sculpt in Maya, let's create the skeleton for the spine, neck and head. Press F2 to switch the toolset to Animation, and then make sure you are working in the Side view. Now go to Animation>Joint Tool, and using the LMB, make a series of clicks from the root of the character (slightly below the belly button) upwards to the top of the head. Click Enter to come out of the tool. If you make a mistake whilst in the tool, use the Backspace on the keyboard to remove the last joint and then the LMB to continue the joint chain. For our joint chain, we've created four joints for the spine, two for the neck, one for the head and then a joint at the top of the head (purely for aesthetic reasons). Now if you need to reposition the joints, you can rotate them and use only the Translate X attribute of each joint (which refers to its length). Once you are happy with the joints, select the root joint of the chain and go to Modify>Freeze Transformations. Make sure all joints have 0 values for their rotations, and then go through and name the joints accordingly. Our joint chain is labelled like so from root to tip: "spine1_jnt", "spine2_jnt", "spine3_jnt", "spine4_jnt", "neck1_jnt", "neck2_jnt", "head_jnt" and "headEnd_jnt".

## 03 Arm and finger joints

In the Front view now, create a six-joint chain. Make the first click at the clavicle, following that the shoulder, then the root of the humerus, the elbow, the wrist, and finally at the end of the palm. Again, use just the rotation attributes and Translate X to get the joints into the correct position. Once in place, remember to go to Modify>Freeze Transformations to zero out the rotation values. For the fingers, create the joint chains from the Top view. For each finger, we created a five-joint chain. The first joint was at the origin of each metacarpal, then we created a joint for each of the phalanges, and finally a joint at the tip of the finger. Once you have all your joints in place, select the root joint for each finger and parent them under the wrist joint. Make sure to then go in and rename the joints. As this is for the left arm, also add a prefix of l_ to all the joints.

## 04 Create the root and hip joint

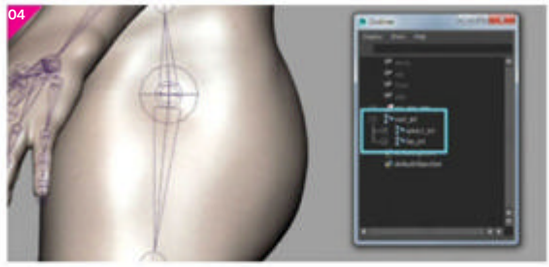
Let's create the root joint next. This joint will carry the entire rig. For the root joint, jump into the Side view and create a single, isolated joint. Create this away from the rest of the rig so it does not attach itself to the current skeleton. Next, hold down the V key and point snap it to the same position as the root of the spine chain. Rename this joint "root_jnt". Now for the hip: still in the Side view, create a two-joint chain, and then rename the joint chain from root to tip: "hip_jnt" and "hipEnd_jnt". Now select hip_jnt and point snap it to the same position as root_jnt. Next take the root joint of the spine (spine1_jnt) and hip_jnt, and parent them under root_jnt. Then take the root joint for the arm chain (clavicle_jnt) and parent it under the closest spine joint (spine4_jnt).

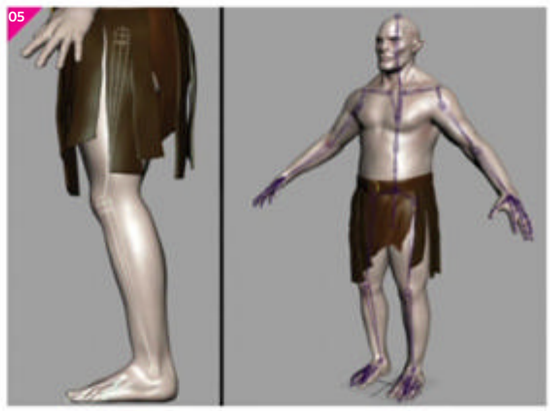
## 05 Continue to make the leg and toe joints

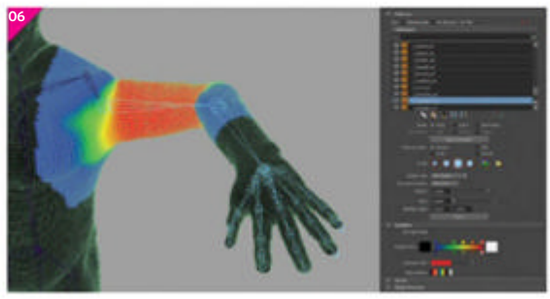
For the leg, create a five-joint chain in the Side view. The first joint was placed just below the root joint, then at the knee, the ankle, the ball of the foot and then the tip of the toes. Again, rename the joints (adding l_), and work in all the views to translate and rotate the joints into place. For the toe joints, create them in a similar way to the finger joints by starting with the metatarsals and then working down the toes. Once the toe joints are created, select the root joint for each toe chain and parent them all under ball_jnt. Remember to freeze the transformations on all the joints so that we have clean rotation values. Now take the root joint for the leg and parent it under hip_jnt. Next, mirror the left joints over to the right-hand side. Start by selecting the leg joint and go to Skeleton>Mirror Joint (Options). When the window pops up, make sure Mirror across is set to YZ, Mirror function is set to Behavior, Search for is l_ and Replace with is r_. Once the leg is mirrored over, repeat the process for the arm. The model is not fully symmetrical so just go in and check that the mirrored joints are correctly in place.

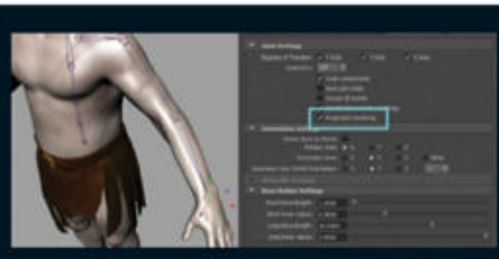
## 06 Skin the model

We now need to attach it to the model, via a process referred to as skinning. In the Outliner, start by selecting all the joints other than the end joints (as we do not want these as part of the bind). Then Shift-select the model in the viewport and go to Skin>Smooth Bind (Options). Use the following settings and hit Bind Skin: Bind to: Selected Joints, Bind Method to Geodesic Voxel (or Classic Distance if you are using Maya 2014, 2013), Normalize weights to Interactive, Max Influences to 8, Falloff to 0.3 and Resolution to 1024. Once the bind has been calculated, you can rotate the joints and the model should deform. Some areas by default will be pretty pants and we'll need to clean up the initial bind. To do this, we primarily use the Paint Skin Weights Tool. With the model selected, activate the tool and in the Settings, you should see a list of joints that are influencing the model. Here you can select a joint and then define how much influence that joint has over the vertices of the mesh. Go through and pose the character by rotating the joints, and use Paint Skin Weights to tidy up the troublesome areas. Only focus on one side as we can always mirror the weighting over. For this tutorial, it took around 45 minutes to one hour to paint the weights.



### Projected centring

If you are using Maya 2015, you can take advantage of Projected Centering. This will let you create your joints in the Perspective view and, automatically, the joints will centre themselves in the mesh. To enable this, go to Skeleton>Joint Tool (Options) and enable the checkbox.

## Export a skeleton to Mudbox

For this tutorial, we exported an OBJ file and added the pose as a sculpt layer in Mudbox. Another technique you may want to try is sending the entire Maya skeleton over to Mudbox. To do this in Maya, group the rig and the geometry all together. Then export the group node out as an FBX file. Now import that file into Mudbox, jump into the Pose tools, and you should see your skeleton in place and ready to pose. Simply subdivide the model, pop the Displacement map on top, and you can handle all your posing in Mudbox using the skeleton created in Maya.

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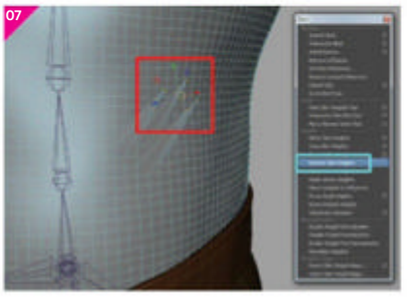

**07 Mirror the weights and clean them up** With the main forms deforming well on one side, we can mirror the weights over. To do this, select the model and go to Skin>Mirror Skin Weights (Options). In here, set the Mirror across to YZ, enable Direction, and hit Apply. Again, rotate some joints to check if the weights have been mirrored over. At this stage, you'll probably find that you have a few vertices that are not behaving as well as you'd like. For example, on our rig, rotating the arms resulted in some of the vertices of the belly being pulled. To fix this, we could continue to paint the weights, but to fix this quickly we used the Hammer Skin Weights tool. To use this tool, select the troublesome vertices and then go to Skin>Hammer Skin Weights. Hopefully by now, you'll have taken care of the majority of the skinning. Once you've finished using the Hammer Weights tool, pop the rig back to its default pose and mirror the weights over again.

**08 Add IK handles and controls** At this stage, we could pose the mesh and send it back to Mudbox. What we'd like to do now, however, is quickly add some IK handles and some controls to make the process of posing the character slightly faster. This will also help to keep the legs planted on the ground when posing the hips and the torso. We'll explain the process for the left arm here, but you can repeat the step on the right arm and the legs. Start by going to Skeleton>IK Handles (Options) and then set the Current solver to Rotate-Plane Solver. Next make a first click on l_upperArm_jnt, and then a second click on l_wrist_jnt. You should now be able to select the IK handle that has been created, and using the Move tool, you can pose the entire arm. You can also use the Twist attribute that lives on the IK handle to position the elbow. IK handles are created in world space so you cannot simply zero out the Translate values to get them back to their creation position. To enable us to do this, let's create a control. First, go to Create>NURBS>Circle (make sure Interactive Creation is disabled) and then rename the circle "l_arm_ctrl". Now with l_arm_ctrl selected, hit Cmd/Ctrl+G to group it to itself, and rename this "l_arm_ctrl_offset". We now need to position the control so select l_arm_ctrl_offset, hold down V, and point snap the _offset node to the same position as the IK handle. Now take the IK handle and parent it under l_arm_ctrl. You should now be able to use the control to position the IK handle, and zeroing out the values of the control (not the scale) should result in the IK handle going back to its default pose.

**09 Pose the sculpt** Using a combination of the FK joints and the IK controls, pose the character as you wish. If you do find that there are artefacts in the pose, do not worry yourself, we will clean these up before we send the model over. With the sculpt in the pose, duplicate the mesh and then hide the original skinned model. Now take the duplicated mesh and go to Edit>Delete By Type>History and then unlock the transform attributes in the Channel Box. Next, select the mesh and hit F3 to switch to the Polygons menu set. Then go to Mesh Tools>Sculpt Geometry Tools (Options). Set the Operation to Relax and then start cleaning up the troublesome areas using the left mouse button. You could handle this in Mudbox but the Relax feature of this tool is a firm favourite of ours.

**10 Send the pose to Mudbox** Go to File>Export and save the model as an OBJ file. We've named the file "orc_poseA.obj". Next, jump into Mudbox and make sure the sculpt is at its lowest subdivision level. Then go to the Layers tab and make sure you are looking at the Sculpt layers. Click on the Options icon (small, round grey icon), and go to Import Layer. Select orc_poseA.obj and the sculpt should immediately jump to the new pose. You should now be able to jump up the subdivision levels to reapply the hi-res details. If for any reason, you find that the hi-res details have a bubbly effect (this seems to happen in around one in ten sculpts), this is how you can go about cleaning it up. First, pop the sculpt back to its default pose, and then extract a Displacement map (usually a 4k, 32-bit floating point EXR). The mesh we're using has UVs but if it did not, then take advantage of Ptex. Next, delete all the subdivision levels on the sculpt (Mesh>Delete Highest Level). Then resubdivide the mesh back up to its highest level, and apply the Displacement map (UV & Maps>Sculpt Using Map). You should now be able to apply the pose or any other pose and have everything look as it should.

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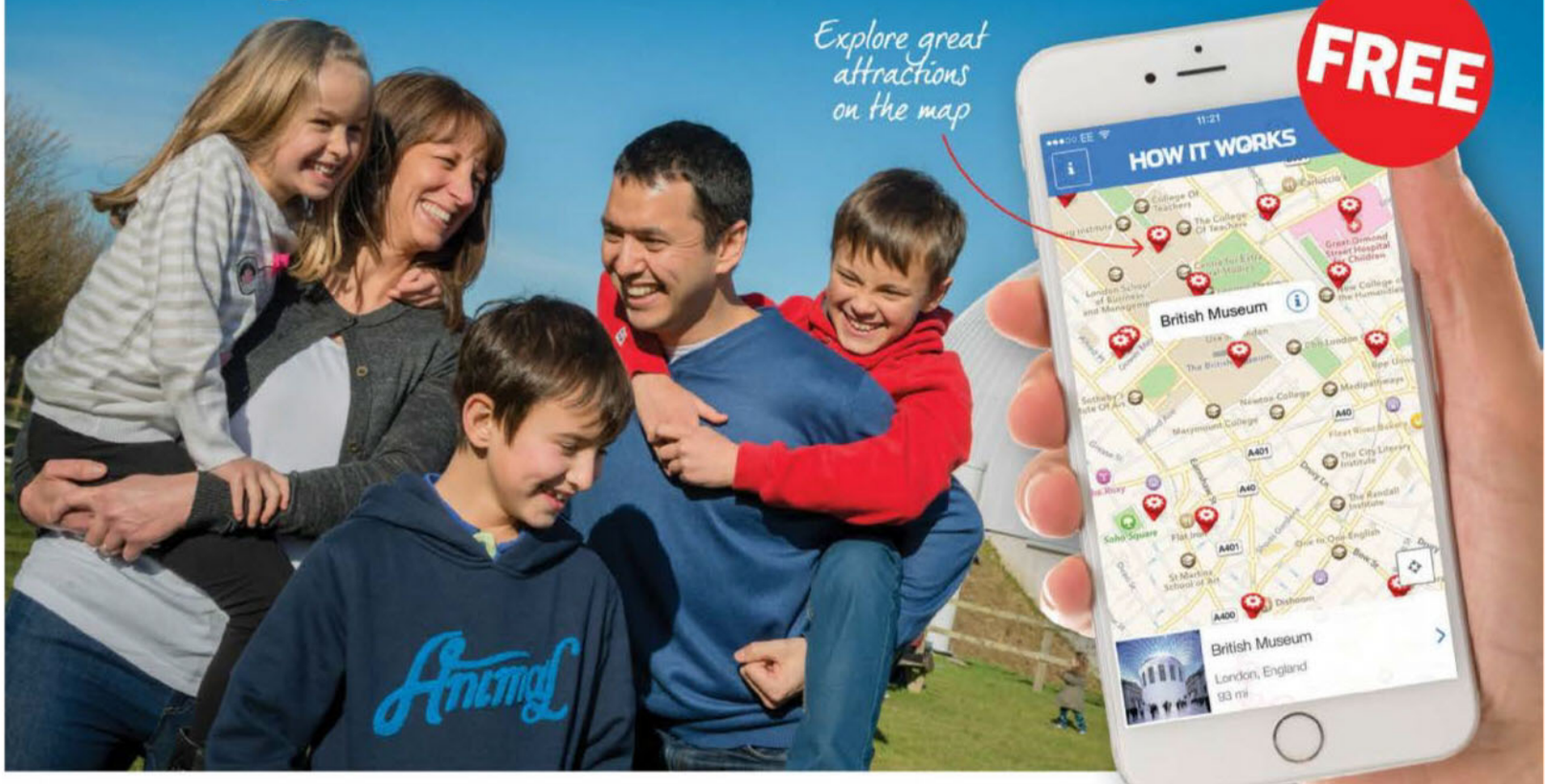

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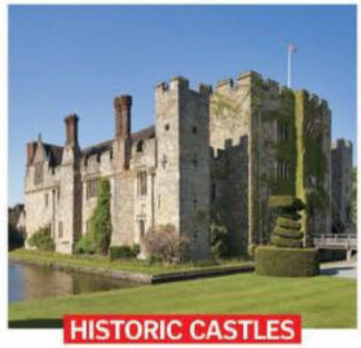
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HOUDINI 14

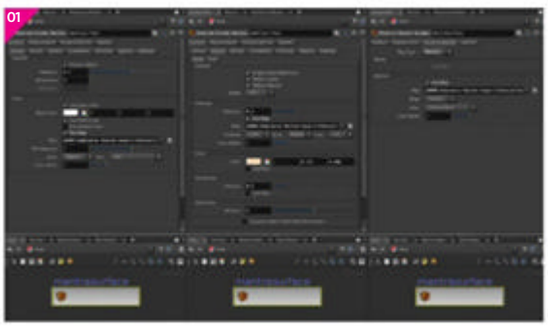
# Master animal fur with Houdini 14 grooming tools

In this tutorial we will go through Houdini's shelf tools and use a variety of them to give a small caterpillar its first hairs. We'll start with importing all necessary files, and afterwards we will let Houdini automatically build a hair or fur network around the caterpillar geometry.

Our journey starts by drawing hair guides by hand. Houdini 14 provides a couple of new tools for artists to add and modify hair in a fast and intuitive way. First we draw hair guides on the first body part, behind the head of the caterpillar, to get a feeling of the new tools. When the hair is in place it's about time to move to the supporting tools. The first pass will be used to place hairs around the body. The second pass will be a refinement pass in terms of length adjustments. A tool called Extend expands the guides and will be used to achieve a proper length. Afterwards it's time to bring a bit of variation to the hair length via a Length Adjust and Extend hair brush. Then we will switch between different pencils, which enables hair adjustment on screen and in the surface space for improving the look. The third pass covers the hair placement all over the caterpillar, including adjustments to train your dexterity with these tools.

Not only is the placement important, but so is the colourisation from the root to the tips of each hair and the reflection information. The base for the colour tweaks needs light sources placed in the scene. We will do this by changing default colours to fit our needs and adding a proper reflection for a realistic touch. We also dive into the render properties from the hair or fur network and adjust the render density including effects around the guides. At the end we dig into Mantra parameters after the rendering is done, to avoid aliasing on the hairs and for a reasonable global image output. Then we will create a new ROP network and build our own Mantra setup for rendering.

**01 Bring in the caterpillar** Import the caterpillar, assign a material and set up the material with the correct textures. Go to File>Import and hit Geometry. Pick the caterpillar mesh and in the Network Editor pane go to the 'shop' network. Now create a Mantra surface material. In Diffuse set Intensity to 0.5 and apply the Diffuse map. In Reflection set Intensity to 0.3 and apply Intensity as the Reflection map. For Roughness, set 0.2 and add a warm colour tone. Under Bump and Normal activate the Normal map and assign the corresponding Normal map. Jump into the caterpillar geo node and add a material node plus the reference to the material.

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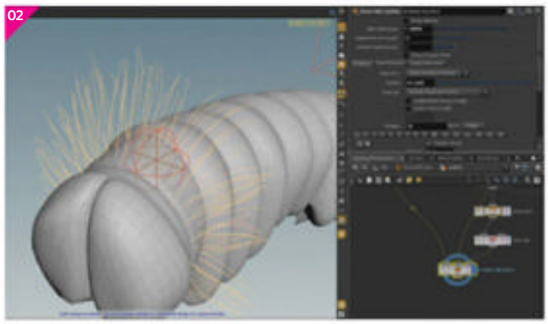
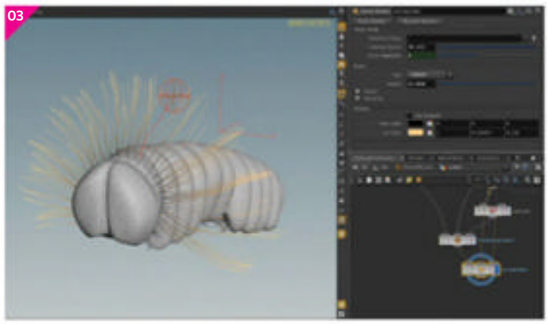
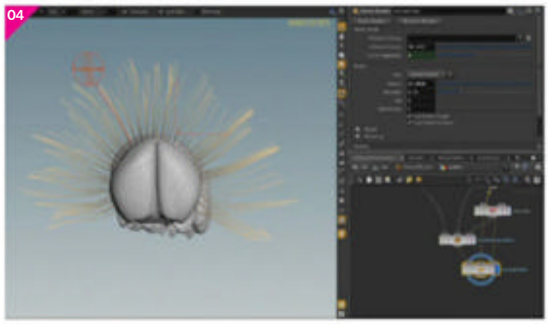



## Caterpillar fur animations

If you want to animate objects which contains fur then it's highly recommended to work with a Rest SOP. The idea behind it is that fur will be stretched during a surface deformation. If you don't do that, hair and fur will be constantly added and subtracted, giving it an unnatural feeling. Add a Rest SOP after the actual character node and attach a transform node to the Rest SOP before you transport the information into the hair or fur network.

**02 Basic hair drawing** At this stage just select the caterpillar in the 3D viewport. The corresponding node in the Network Editor pane should be highlighted yellow when it's selected. Afterwards go to the Grooming tab in the pane for the shelf tools. Pick the first function Draw and hit the Enter button. Houdini will now create the appropriate network for you in the Network Editor pane. The hair brush is now active. Just start painting basic hairs around the caterpillar's body according to the supplied reference pictures. Hold the Alt key and left mouse button to rotate in the 3D viewport.

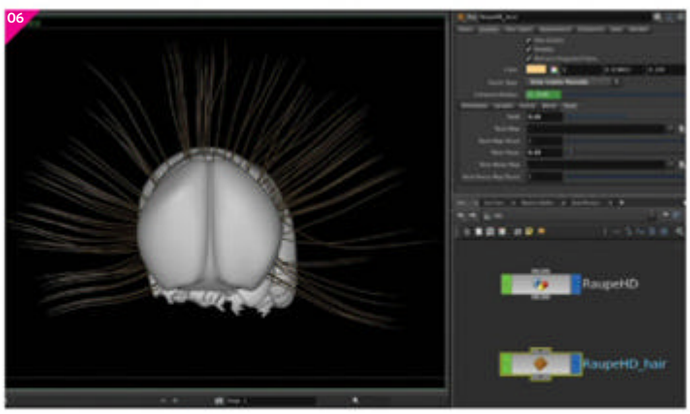
**03 Length refinement of the hair** After the basic hair is in place it's time to start with the hair cosmetics. Let's adjust the hair length to fit the visual representation of bristled hair. Go to the grooming shelf, hit the function Extend and start to lengthen the hair. Use the mouse wheel to change the size of the brush and change the radius in the parameter pane under the field called brush. If you feel that you have not got enough hair guides press the function Paint hair and fill the gaps with new hair guides.

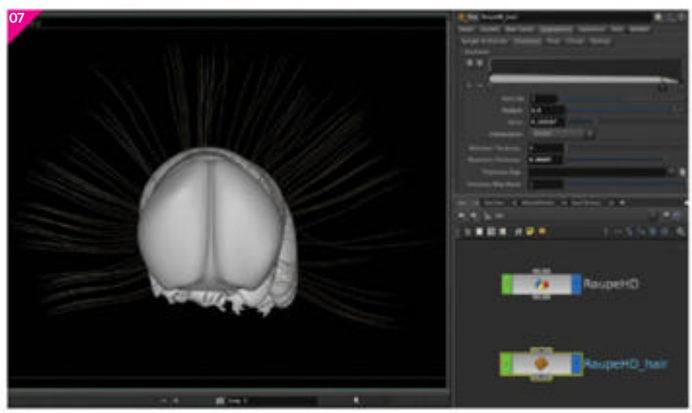
**04 Time to bring in variation** The basic ring of hairs is in place with the correct length according to the reference and we can refine the look by adding some length adjustments and combing the hair. Now start with the Length Adjust function in the grooming shelf. This function basically varies the length of the hair interactively to give the hair a more natural look. Subsequently use the Screen brush, which can be found in the grooming shelf as well, and start aligning the hair in the screenspace so that it looks orthogonal to the surface.

**05 Correct visual cues** The actual render output will not look as expected if you render now, so we must change some core parameters to get increased visual fidelity as close to the reference picture as possible. Select the fur node of the caterpillar, which holds the hair network, in the Network Editor pane. The parameter pane holds a bunch of interesting values to change the hair type. Let's change the Segments to 6 and the Render Density to 0.01. The ladder value controls the appearance of the rendered curves on the surface and the first one adds more segments to the curve.

**06 Changing the hair to bristles** Now we need to give the hair a bristled look so let's work on the guides directly. In the parameter pane you'll find Guides next to Basic. We now look at the subtabs Bend and Twist. Under Bend decrease the Bend and Bend Noise value to 0.1 and the values for Twist and Twist Noise to 0.05. Both changes ensure that we get a bristled look without a needle-like look for the fur.

**07 Apply correct thickness** At this stage we have a pretty good setup for the bristles. What is left, before we jump to the material, is the correct hair thickness. At the moment they are too big in their appearance. To change the thickness just dive into the Appearance tab. In there is a premade ramp which gives control over the hair look. Just use a value of 0.3 for the first point, 0.2 for the second and the last can be default. We'll now have thin bristled hair – ready to be colourised.



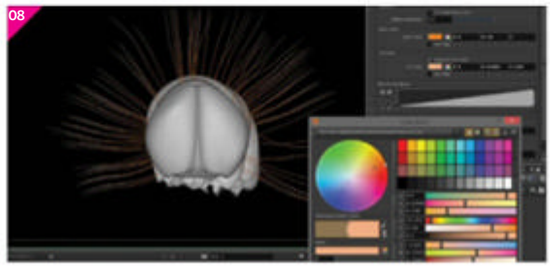
**08 Diffuse colourising of the hair** Houdini did not only create an automatic hair or fur system for the caterpillar, it added a material as well. Just select the hair or fur object of the caterpillar in the Network Editor pane. Then under Basic, press the arrow next to the Material slot – this works like a teleport to the corresponding object. In the new parameter pane under Diffuse you will now be able to see the root and tip colour properties. Change the root colour to an orange colour first (RGB 0.9, 0.233, 0) and then change the tips of the root to a really light orange colour (RGB 0.9, 0.43, 0.23).

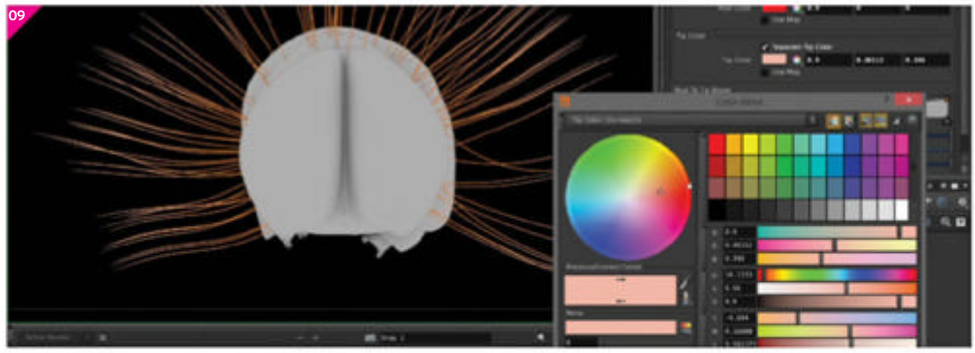
**09 Work on a proper reflection** Now as the Diffuse is pretty much set it's time to work on a proper reflection for the hairs. Before we start, let's add an environment light in the scene. Just go to the Network Editor pane, right-click and type "environment light". You'll now see the needed object. Add one and we can start working on the reflection in the hair material. Go back to the Material tab and switch to the Reflection tab. There are also two colour information values for the root and tip colours that are needed here. Use a reddish colour for the root (RGB 0.9, 0, 0) and for the tip a rose tone (RGB 0.9, 0.5, 0.4).

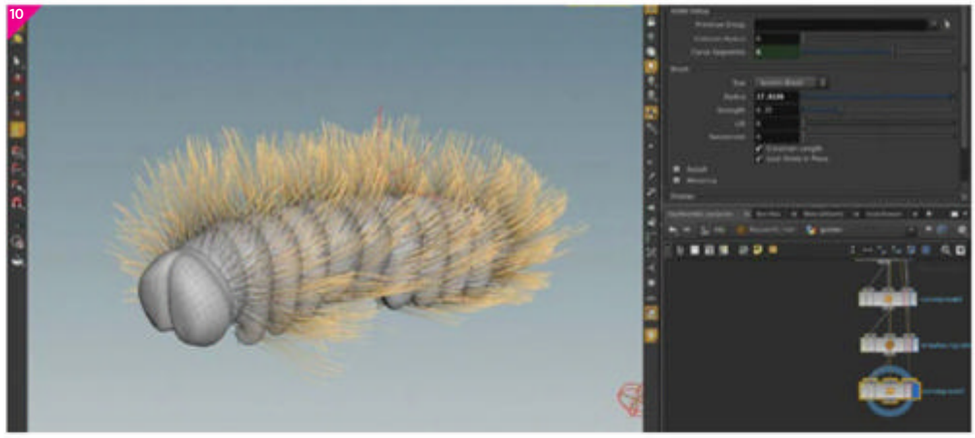
**10 Finalise the hair placement** For now we just focused on the first part of the caterpillar to learn all of the substeps until the final colourisation. Start with drawing hair on each caterpillar body segment, checking the reference pictures to finalise the placement. Do this step by step with a basic placement at first. Use the support tools like Length Adjustment, Extend hair, Screen Brush and Surface Brush. The ladder lets you interactively groom hair around a surface. This will give you a basic training of the grooming tools. Alternatively, use the Lift hair function to push the hair away from the surface and increase the Render Density to fit the reference.

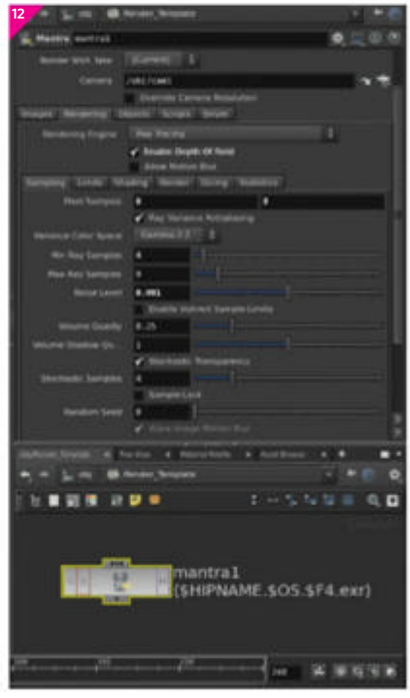
**11 Polish the overall look** At this stage we move closer to the final image design. As we now have the hair in place we need to finalise the global look of the painted hair. If we take a look from the side, the hair must follow a look with a peak in the middle and a falloff on the sides. Again we make use of the Length Adjust function and form the hair accordingly. In addition to this refinement it's necessary to increase the length of the hair at the first and last body segment of the caterpillar – according to the reference pictures. Use the Extend hair function to increase the hair.

**12 Proper rendering parameter** The hair placement is done and what are left are the rendering parameters for a high quality render. Mantra itself has optimisations for fur and hair rendering, but let's increase the quality by hand. Go to the Network Editor pane on OBJ level and create a ROP network node. Inside this node add a new Mantra node. In the parameter pane increase the pixel samples to 8 by 8 and decrease noise level to 0.001. Increase the minimum ray samples to 3 and you'll have a decent render output.






## Moving fur in the wind

Dynamics are really important for a natural looking hair and fur simulation. A stretching of the guides alone won't achieve this. To achieve natural-looking hair add dynamics to the hair guides. Select the guides first, go to the hair shelf and press the function Add Dynamics. You can play around with the bend and stretch stiffness parameters on the fur object for a bristled look and feel. The core of this functionality is a wire object plus the corresponding dynamics network. You can also bring in wind for your simulation.



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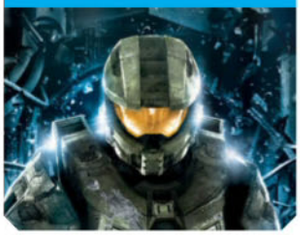

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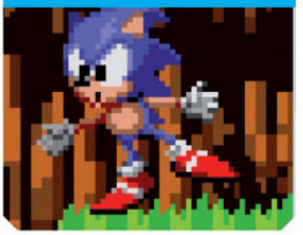

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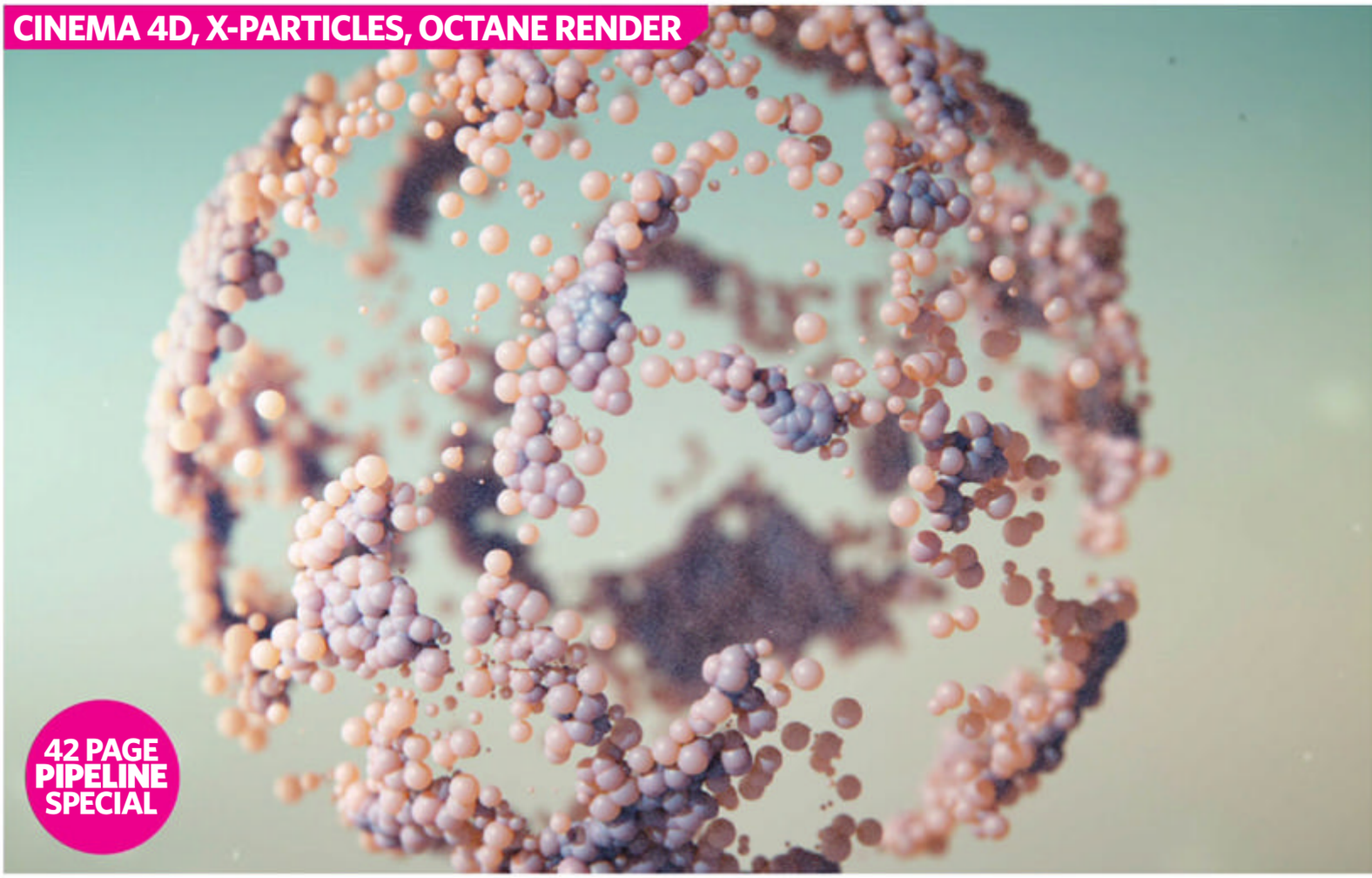


42 PAGE PIPELINE SPECIAL

# Create abstract particle renders

Creating interesting images with particles and Cinema 4D is now easier than ever with the integrated plugin X-Particles, and creating abstract and organic imagery that looks and feels real can be an interesting challenge.

Creating abstract imagery is just as technical as creating real-world imagery. There are many things to consider, such as composition, colour, lighting, scale and camera settings. While you can jump in, tweak some settings and hit render, the beauty of creating compelling abstract imagery is in the details. If you make good decisions from the start, you'll arrive at a more effective result quickly.

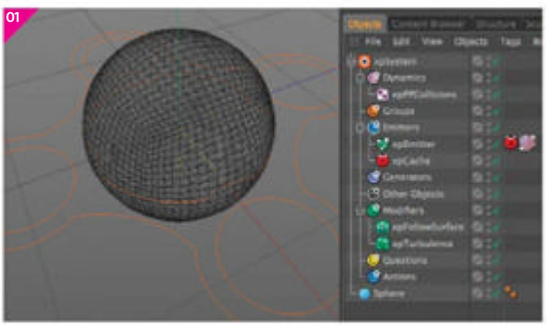
MAXON Cinema 4D is our 3D application of choice as it is more intuitive than other applications. With MAXON Cinema 4D Studio, the Mograph toolset is powerful and easy to dive into, and you can experiment with dynamic simulations that are extremely realistic.

X-Particles 3.0 is the most comprehensive and advanced particle simulation tool for Cinema 4D, and gives control over every aspect of the particle pipeline. While we have not dived into advanced features – like Python, or XPresso Nodes – we have enjoyed the ease of forming interesting simulations.

OctaneRender for Cinema 4D is our render engine of choice. It is the world's first and fastest GPU-accelerated, unbiased, physically correct renderer. Its development has been astounding, and it visualises renders nearly in real-time, which provides more time creating and less time waiting.

This tutorial will follow a traditional process, where we jump into the software with a rough idea, and see what comes up in a couple of hours.

Then, we'll show you some mixed lighting techniques and how to add intuitive Octane materials with subsurface scattering, which emphasise the organic feel of the image. In the end, we'll use Adobe Photoshop to add effects and imperfections to enhance the sense of realism.

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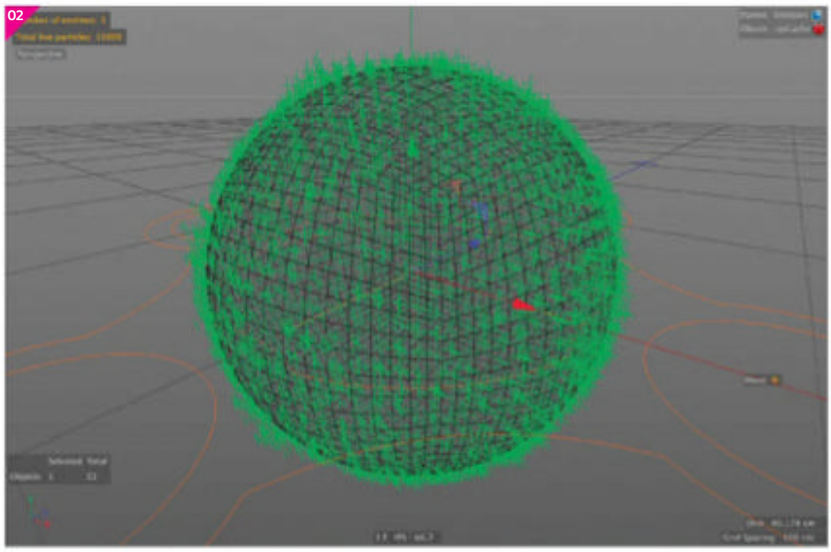
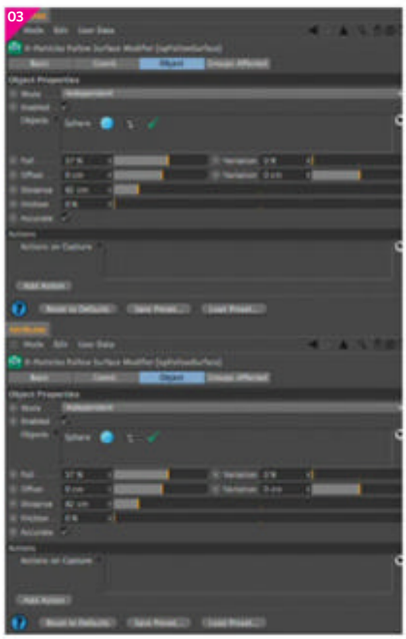



## 01 Set up the X-Particles system

First we'll set up a basic X-Particles system. This helps us to stay organised and keep the order of operations in Cinema 4D in its proper hierarchical order. By doing this we ensure that errors don't occur in the calculations of simulations. With the X-Particles system set up, you can visualise where emitters, generators, modifiers, and other objects should go in the object manager.

## 02 Emit from an object's surface

Next, we'll add an xpEmitter and a sphere. In the emitter's object tab we'll tell it to use the surface of the sphere as the source to emit particles from. Since you'll want to emit particles from the first frame only, go to the Emission tab, and select Shot from the Emission mode drop-down menu. Choose how many particles you'd like to be emitted in the Shot Count field. You can start with a lower number, say 5,000, to preview simulations quickly. Lastly, choose the radius of your particles, create some variation in their scale, and reduce the particles' speed to zero.

## 03 Add X-Particles modifiers

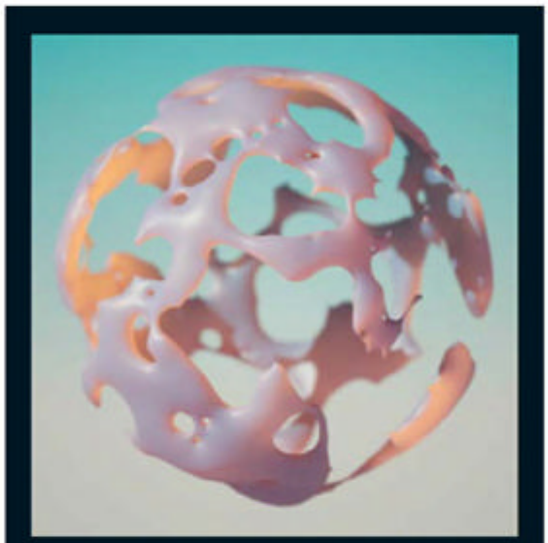
In this scene, we'll add two modifiers, xpTurbulence and xpFollowSurface. The xpTurbulence modifier moves the particles around in an organic manner with different variations. The xpFollowSurface modifier pulls moving particles across whatever object's surface it is referencing. In this example, we're going to add the same sphere to the xpFollowSurface object list. This way the objects will emit on the sphere's surface, get moved around by the turbulence, and will follow the geometry of the sphere.

## 04 Shake things up

X-Particles' turbulence modifier has many options, but its curl noise is very interesting. By adjusting the Blend and Add values, you can create interesting and organic movements. You can play with your simulation and adjust these values, as well as the scale, frequency, octaves and strength values to achieve different results.

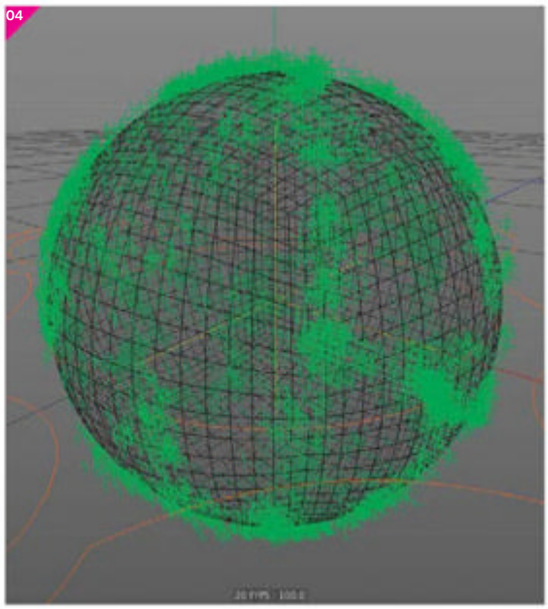
## 05 Add particle collisions

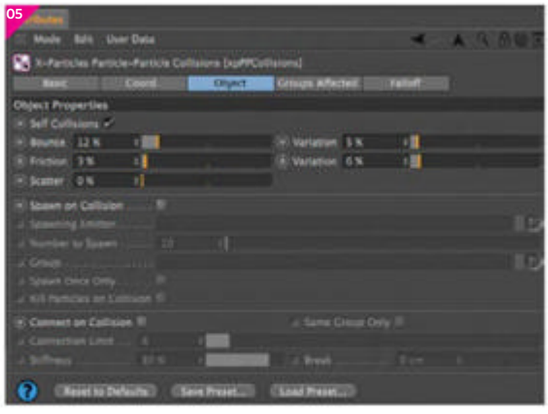
Up until now, our particles only interact with the surface of the sphere. They are not interacting with each other and are intersecting. One way to prevent this is to add an xpPPCollisions dynamics object and check Self Collisions. The particles will now interact with each other, bouncing and sliding away once they collide. Some will still intersect, but not as much as before. Keep in mind, adding this increases the amount of calculations that X-Particles needs to make, and the simulation will not run as fast. Not to worry though as we can cache our particle simulations.



## Show some skin

The X-Particles Skinner object is another great tool to experiment with. You can quickly 'skin' to your particles to create organic forms or fluid like shapes. Basically the Skinner object creates a mesh from emitted particles, that you can customise with different parameters.



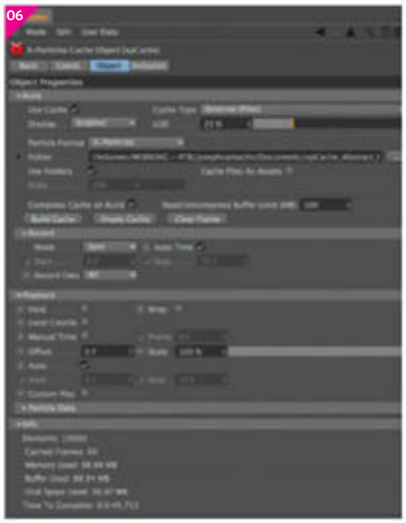
**06 Cache the simulation** The xpCache object is essential to saving, visualising, and scrubbing easily through heavy particle simulations. It also ensures that what you see in your viewport, or Octane's Live Viewer is what you will see in Cinema 4D's Picture Viewer and your final render. With that, add an xpCache object to your scene, and click Build Cache. X-Particles will save the simulation to your hard drive and you can scrub through to select a frame on your timeline where you like how the particles look.

**07 Set up the Octane Camera** Since this is an organic, almost molecular structure, you should give some consideration to the focal length and depth of field of your camera. Macro lenses are famous for their shallow depth of field, and often are 100mm or more. This emphasises the tiny scale we're trying to emulate. Set up an Octane Camera, and in the Attributes manager change the focal length to 200mm and experiment with other values to see the different effects. One of the most convenient features of OctaneRender is the ability to quickly select your focus distance by clicking on the object or particles you want to focus on. You can do this in the Live Viewer. Deselect Auto Focus in the thinLens tab of the Octane Camera tag, then increase the aperture value to create a more shallow depth of field.

**08 Subsurface scattering materials** We chose to use a material with subsurface scattering because it can add a sense of life to objects. First, create a new Octane Diffuse material, and choose a base colour in the Diffuse tab. Next go to the Transmission tab, and add an Octane RGBSpectrum texture to the Texture channel. Choose the colour you would like to transmit once light goes through the particle. Finally, in the Medium tab, add a Scattering Medium texture to the texture channel. This will give you absorption and scattering textures. Most times, you can leave Absorption at 0 and Scattering at 0.5. The scale slider is what controls how easily light can be absorbed and transmitted through the object – or in this case, the particles. We've used 1.75.

**09 Lighting** Next add an Octane Daylight object to the scene. It comes with two tags, an Octane Daylight Tag, and Sun Expression Tag. First, make sure the Sun Expression Tag is enabled by checking it under Basic. Control the placement of the sun by using different longitude and latitude values, and experiment with different looks (sunrise, midday and sunset). Now select the Octane Daylight tag. The options in here are intuitive and flexible. You can increase turbidity, power, north offset and sun size, so experiment again. We've changed the sky colour and sun colour to be warmer and brighter.

06

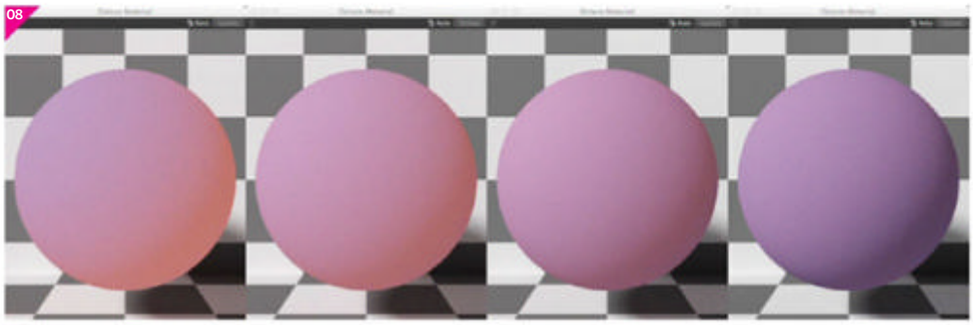


07

## Start, experiment, finish

X-Particles has many different modifiers and parameters that you can manipulate to create amazing images. Take the time to try out different tools in different combinations to see how they work. Once you sit down and play around, the hours will fly by and you might not have something completed. Try to give yourself a set time to experiment and come up with a completed render to share with the Cinema 4D community.

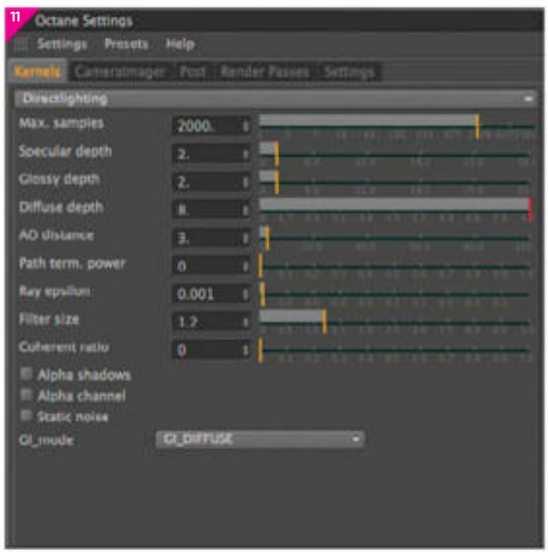
08

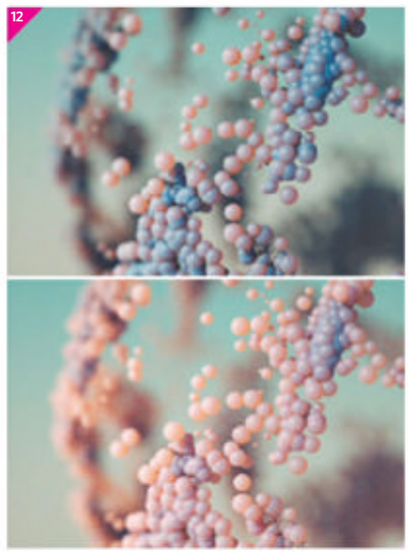


09

**10 Creative lighting choices** Adding an Octane targeted Arealight was a decision made because we wanted to have a sense of directional lighting and push more light into a specific area of the particles. To do this, select the sphere, and then add an Octane targeted Arealight. The light will always point at the sphere. You can adjust the temperature of the Octane Light to be warmer or cooler, and the power and distribution of the light to be stronger or weaker. If you deactivate the Daylight, you can visualise how much the area light is contributing.

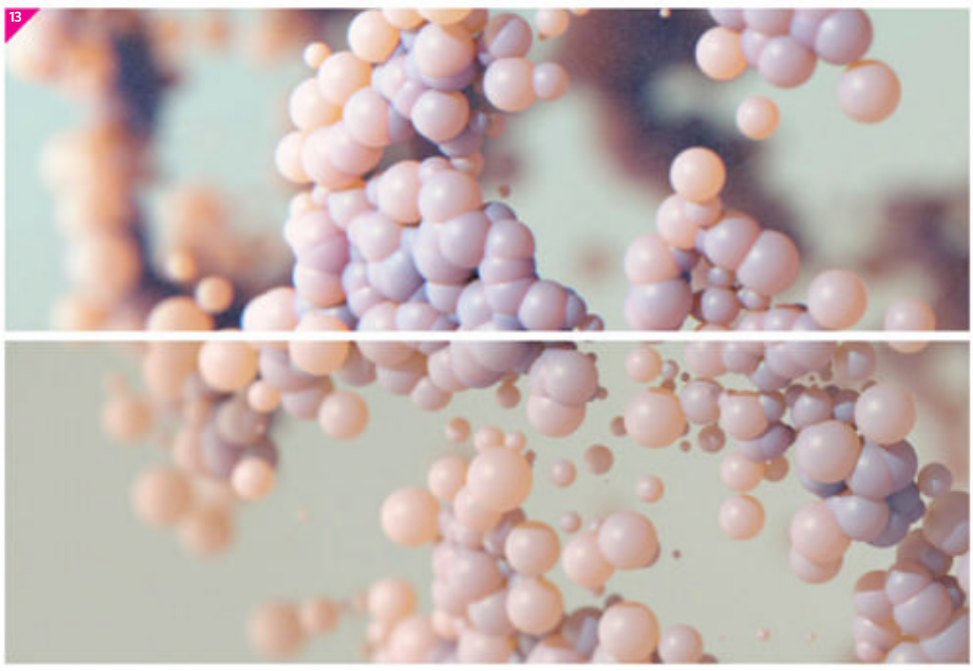
**11 Make creative adjustments** Now that you have your lighting set up, go back and make some adjustments to your materials, camera and composition. Take time to fine-tune the overall look while reviewing some of your previous decisions. Maybe you'd like to make the turbulence slightly smaller? Maybe your colours are too bright? Is your sun too bright? Where does your eye go to? These are all good questions to ask yourself, when preparing for your final render.




**12 Rendering considerations** OctaneRender has many render kernels to choose from. We usually choose Directlighting and the GIDiffuse option. This isn't unbiased path tracing, but it provides very realistic results quickly, and because this is an abstract render, we can use it without being worried about exactness. You can increase the Specular, Glossy and Diffuse depths in the Octane Settings panel to improve the way light bounces in the final render. Since we were using a material with subsurface scattering, we increased the Diffuse depth to 8 so that light would interact with the particles in a more convincing manner. Again you can experiment with the different settings to see what works. Lower settings speed up render times, but reduces quality. Hit render and then let's head over to Adobe Photoshop.

**13 Add imperfections and finish with final tweaks** In Adobe Photoshop, add things like lens distortion, chromatic aberration, and vignetting to emphasise the imperfections found in real-world cameras. Most of these options can be found under the Lens Correction filter dropdown. Colour grading an image is always a subjective matter, and a very creative choice. What you choose to do with you colour will say different things about your image. In general, a less vibrant image seems more real. Also, there is no such thing as pure black in the world, and every black has a touch of colour to it. Finally, adding dust, light leaks or other textures in Photoshop helps to create a sense of space and depth. Dust can be created with a soft-edged brush with high scattering settings, or with hi-res images of scanned dust particles from the internet.




## Change the lighting, change the mood

Lighting is a critical part in any render. Take some time out to understand it, and how it can help emphasise shape and form, while also making an impact on the overall mood of your image. Understanding terms like 'low-key', 'high-key', 'rim', 'key', 'fill', and other photographic lighting terms will help you to understand what lighting changes you can make in your images to make them stand out.

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# PNY Nvidia Quadro M6000

## Nvidia's new top-end graphics card based on its Maxwell design is the first Quadro to offer really stunning OpenCL performance

It seems Nvidia updates its most high-end Quadro card according to a different timescale to the rest of the family. Last year we were treated to a top-to-bottom refresh of every Kepler-based Quadro, except the K6000, which was left unchanged. The K5200 came along with double the memory and a large boost to its shader count, narrowing the gap between the best and second-best cards, and making the more expensive K6000 seem like an unwise purchase.

Until now. The M6000 is its replacement, being the first Quadro to use the new Maxwell design, which debuted in mobile and gaming cards. This one is a newer second-generation variant code-named GM200.

Looking at the card's specs, it doesn't immediately seem like an impressive upgrade. The K6000 had 2,880 shaders, the M6000 has 3,072. The 12GB of ECC-capable GDDR5 video memory hasn't been increased at all, AMD's FirePro W9100 and its 16GB of video memory retains that particular record. Memory bandwidth remains at 384-bit. It's still based on a 28nm chip.

But the overall single-precision FP32 compute performance has ballooned from 5.2 TFLOPS to 7 TFLOPS, an impressive 34 per cent increase. This is due to the efficiency of the new architecture. There's been a ten per cent rise in average power draw too, from 225W to 250W.

Double-precision FP64 performance has seen a very sharp decline though, but that's a result that is probably more important to scientists and engineers that are running simulations using Quadros than 3D graphic designers.

The number of ROPs has doubled to 96 too, with the core clock increased from 902MHz to 988MHz and memory clock from 1,502MHz to 1,653MHz. There are also now 256 TMUs and more steam multiprocessors.

Physically, the M6000 has seen some slight changes. Once again a single eight-pin power connector is sufficient, with four full-sized DisplayPort outputs, capable of simultaneous 60Hz 4K output, and a single DVI port.

Nvidia is also touting a few new features. Most interesting is a new CUDA-accelerated iRay plugin for Maya, 3ds Max, Cinema 4D and other packages, which promises real-time ray tracing via a Fast Interactive rendering mode on the M6000.

As with previous top-end GPUs we've reviewed, the M6000 arrived in a workstation chosen to represent a typical system a customer might use it with. Such a powerful card is more likely to be purchased with a similarly pricey and high-end dual-Xeon workstation than an overclocked Core i7, so that's what we received: two eight-core 3.2GHz Xeon E5-667 v3 processors, 64GB of DDR4 memory and a Samsung 850 Pro SSD, all provided by Workstation Specialists.

**BELOW** The specification may not look significant, but the benchmark results prove otherwise

The first test was CINEBENCH. The OpenGL score clocked in at 185.38. It's a great result but it doesn't demonstrate what the M6000 can do.

The SPECviewperf 12 result was more interesting. The narrative of most Nvidia graphics card reviews has been one where the Maya section drops off considerably compared to results from AMD's FirePro line. Not this time. The M6000 clocked a score of 110.8, the K5200 in Lenovo's ThinkStation P900 scored 64.72, and AMD's W9100 in Scan's 3XS GW-HT20 managed 76.75 – meaning a huge boost for the M6000.

The other sections saw new records broken too with 138.65 in catia-04 and 139.21 in sw-03. These scores are off the charts.

But it's OpenCL where the biggest performance increase comes. LuxMark's Room render test has always chugged on Nvidia cards, even the K6000. Historically, OpenCL is a competitor to Nvidia's own CUDA API, and has never been given the same attention. The M6000 represents a change in Nvidia's thinking. Again, the result breaks new records. The 2,231 points leaves every workstation we've tested with AMD's FirePro cards in the dust. The previous best was 1,396 with a W9100, so there's been some improvement!

But a few results are puzzling. ArionBench, a great CUDA-only benchmark, saw far less impressive gains. The K6000 managed 1,986 points in 2 minutes, 31 seconds. The M6000 was just eight seconds faster with 2,088 points. It was an improvement of around 5 per cent, which we confirmed is not an error.

Why this happened, we're not sure. Along with the drop in FP64 performance, which is again, not a problem for most artists, it's possible that not everyone will see such massive performance gains across the board by upgrading to an M6000. But

> It's the most powerful professional GPU ever made and it's also a new object of hardware lust for artists everywhere

**RIGHT** 4K isn't worth using unless it's running at 60Hz, which is why support for four simultaneous outputs is such a big deal

**BELOW** Nvidia's top-end GPU was in need of an update, and it seems the wait has been worth it

**BELOW** M6000's OpenCL performance is an improvement on its predecessor

smaller gains are generally overshadowed by the massive improvements.

The M6000 does put clear water between itself and the more affordable Nvidia cards, making the significant premium it carries well worth the upgrade. It's the most powerful professional GPU ever made and it's also a new object of hardware lust for artists everywhere.

The M6000 can handle multiple 4K displays running at a full 60Hz, highly complex and detailed modelling, and even real-time ray tracing. What a shame this power carries such a high price though, but on the other hand, it's at least at a comparable price level to its predecessor.

The W9100 is £1,000 cheaper, which may sway some, but really we can't wait for AMD's response and what we'll get when Nvidia updates the rest of its more affordable GPU lineup with the new Maxwell chips. Hopefully it won't be too far away.

**Orestis Bastounis**

**ABOVE** The new iRay plugin is currently in beta, but should be a great tool

## Essential info

| | |
|---|---|
| Price | £4,102 inc VAT |
| Website | pny.com/nvidia-quadro-m6000 |
| Unified shaders | 3,072 |
| Video memory | 12GB GDDR5 |
| Output | Simultaneous quad-4K 60Hz |
| Memory bandwidth | 317 GB/s |

## Summary

★★★★★ **Features**
★★★★★ **Performance**
★★★★★ **Design**
★★★★☆ **Value for money**

## Verdict ★★★★★

The M6000 is the world's most powerful professional graphics card. By far

# Workstation Specialists WS-X140

## Workstation Specialists shows how a mid-range workstation can still offer plenty of rendering performance

We love testing high-end dual-Xeon systems with dozens of CPU cores that can chew through heavily multithreaded software in no time at all. But these specialised systems are neither affordable or necessary for the vast majority of artists, who will not only save a considerable amount of money by opting for a more mid-range rendering computer, but may even get better performance from it too, depending on the software and workload.

As we've seen on many occasions, if you're working with scenes with a low-to-medium number of polygons, or with software that doesn't make full use of eight, ten, or twelve-core processors, you could see better results from a Core i7 running at a high clock speed, and will definitely get better bang for your buck.

Workstation Specialists' WS-X140 is one such workstation, built around Intel's venerable Core i7-4790k quad-core processor, which has been overclocked to a mighty 4.5GHz.

With this chip is an AMD FirePro W5100 GPU, a card that is right in the middle of the FirePro line, providing 4GB of GDDR5 video memory, performance that should be a solid foundation for 3D, but without a high cost that seriously inflates the final price, as would happen with any top-of-the-line GPU.

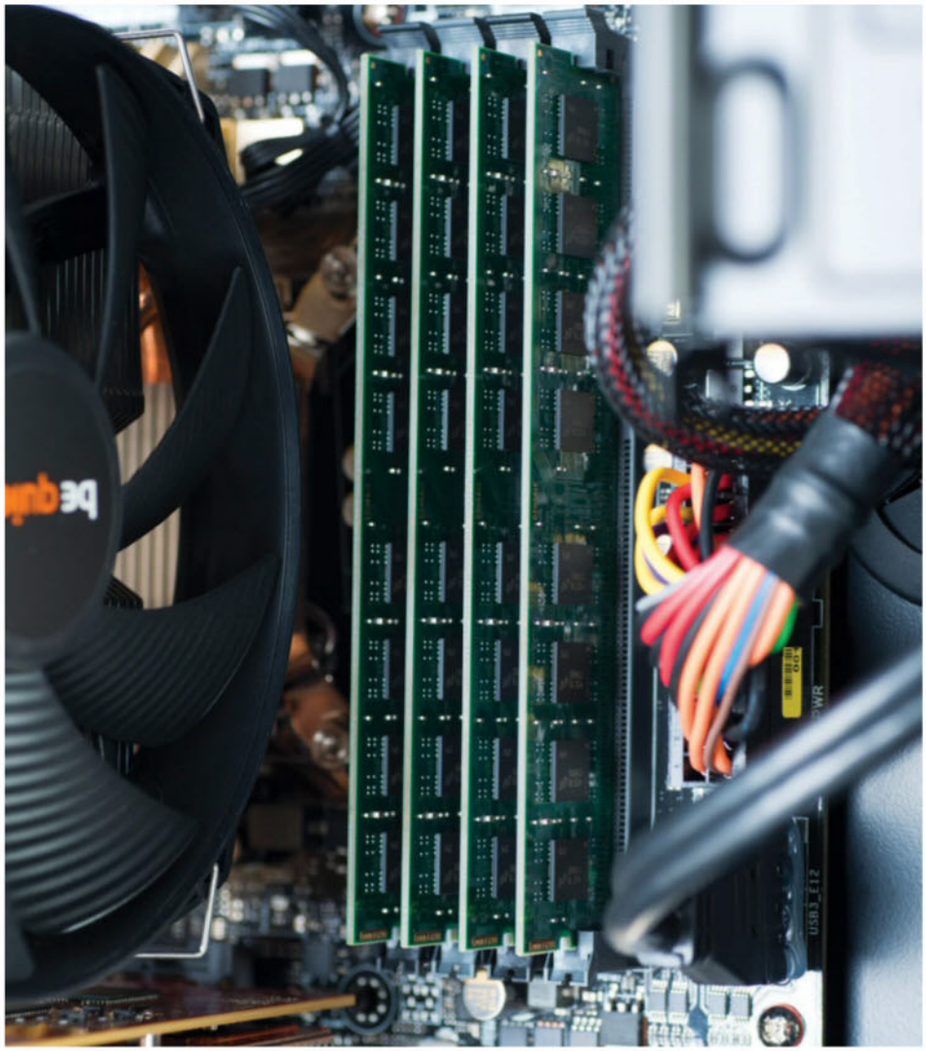
With 32GB of DDR3 memory and a 250GB Samsung 850 EVO SSD, Workstation Specialists has carefully chosen the remaining components so that they don't end up costing the earth, but still help with both rendering performance and overall system responsiveness.

The SSD in particular is half the price of Samsung's top-end 850 Pro, but still one of the fastest around, and gives consistently fast boot and application load-times. It sits in an ASUS Z97-WS motherboard, and is accompanied by a 3TB hard disk for archival storage.

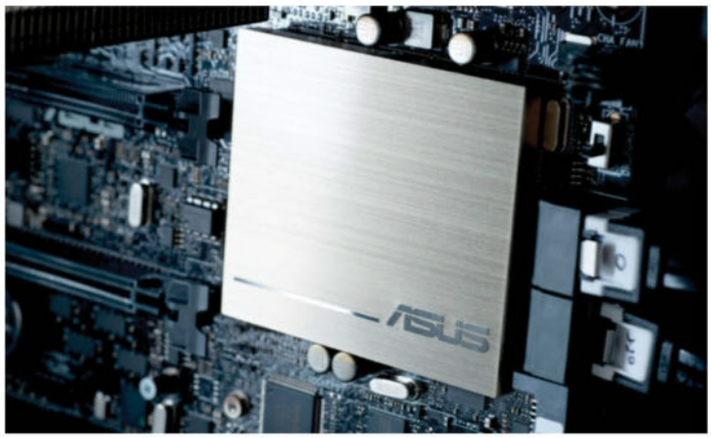
The chassis is the only weak spot. Workstation Specialists use a tank-like Supermicro case for its high-end rigs, with a custom-designed glowing logo on the front. The WS-X140 comes in a cheaper desktop chassis though, with just a branded sticker on the front. It's generally fine, but the fan guard was a bit loose, and there were no thumbscrews for easy access to the internals.

But it's polygon pushing that matters most, and the WS-X140 delivered consistently good results, with a few really superb scores as well.

A CINEBENCH CPU score of 901 shows what a difference the overclock makes, when a stock-speed Core i7-4790k managed 789. And this leads to better rendering times in the 3ds Max Underwater scene at 1080p, from 13 minutes 59 seconds for the stock i7 compared to 12 minutes 53



> The SSD in particular is half the price of Samsung's top-end 850 Pro, but still one of the fastest around



**ABOVE** 32GB of system memory is plenty for mid-range rendering

**ABOVE RIGHT** The fanguard is loose as the chassis isn't very robust

**RIGHT** The ASUS Z97-W7 holds the Samsung 850 EVO SSD

**LEFT** An overclocked Core i7 is more affordable and faster than a Xeon

seconds when overclocked. The most recent comparison for SPECviewperf results is the Nvidia Quadro K2200 in HP's Z440, which is powered by a 3.7GHz Xeon E5 quad-core processor. The WS-X140 edges slightly ahead in six of the eight tests, with about ten per cent better results.

Certain graphics cards work better with some software than others though, the classic example being the better Maya results we normally see from AMD. There are equally some places where the FirePro W5100 didn't quite pip the Z440's Quadro K2200. SPEC's catia-04 and energy-01 tests were behind, as was the CINEBENCH OpenGL result of 102.4, lower than the K2200's 116.7.

But the overall good set of results, solid specification and relatively affordable price proves that the WS-X140 is a great choice of workstation for artists looking for a mid-range upgrade, or buying their first dedicated rendering computer.

**Orestis Bastounis**

## Essential info

| | |
|---|---|
| Price | £1,752 ex VAT, £2,102 inc VAT |
| Website | workstationspecialist.com |
| CPU | Intel Core i7-4790K overclocked to 4.5GHz |
| GPU | AMD FirePro W5100 GPU |
| RAM | 32GB DDR3 |
| SSD | Samsung 850 EVO 250GB SSD |
| Motherboard | ASUS Z97-WS |

## Summary

★★★★★ **Features**
★★★★☆ **Performance**
★★★☆☆ **Design**
★★★★☆ **Value for money**

## Verdict ★★★★☆

**There's plenty of potential in the WSX140. Just customise it with a slightly beefier graphics card to turn it into a powerhouse**

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***Samurai***
Hasan Bajramovic

# The Hub

**The inside guide to industry news, VFX studios, expert opinions and the 3D community**

"In a way I feel like there's a responsibility for me as an artist to use all the contemporary tools that are available to me"

**Jonty Hurwitz**


**086** Community news

## Nanosculptures

We take a look at how 3D prints so tiny they can fit inside the eye of a needle were created and more

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## CELSIUS C740

Pixar launches Non-Commercial RenderMan for free, Fujitsu announces CELSIUS C740, and Carbon3D introduces a breakthrough 3D printing method that is faster than ever before

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## Reader's Gallery

The latest images created by the **3dartistonline.com** community




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The scaffolding the team created was designed to be easily avoidable when taking the final photos

# The smallest sculpts ever created

## Artist Jonty Hurwitz tells us how he used ZBrush to create 3D prints that can fit inside the eye of a needle

**ABOVE** A CNN documentary has now been made about Hurwitz and the team's work. Learn more at **jontyhurwitz.com**

It's not every day that after sculpting and 3D printing a piece of CG work, you worry that you'll inhale it by mistake. For artist Jonty Hurwitz, however, this incredible scenario simply meant he'd been successful. Together with a team of 15 people, Hurwitz spent eight months creating a series of seven nanosculptures: the smallest ever sculpts of the human form in history. The only piece of equipment powerful enough to display them turned out to be an electron microscope. Even the largest sculpt, 'Cupid and Psyche', was barely the width of a human hair.

"With all of my work I try and push the boundaries, I try to push the limits of society," says Hurwitz. "I'd been reading a bit about nanotechnology, and I just thought I'd take a totally long shot and called up the Institute of Microstructure Technology at the Karlsruhe Institute. I literally said to them 'Hey how about we produce a piece of art together?' Within five minutes they got back to me saying 'Right, let's do it!'"

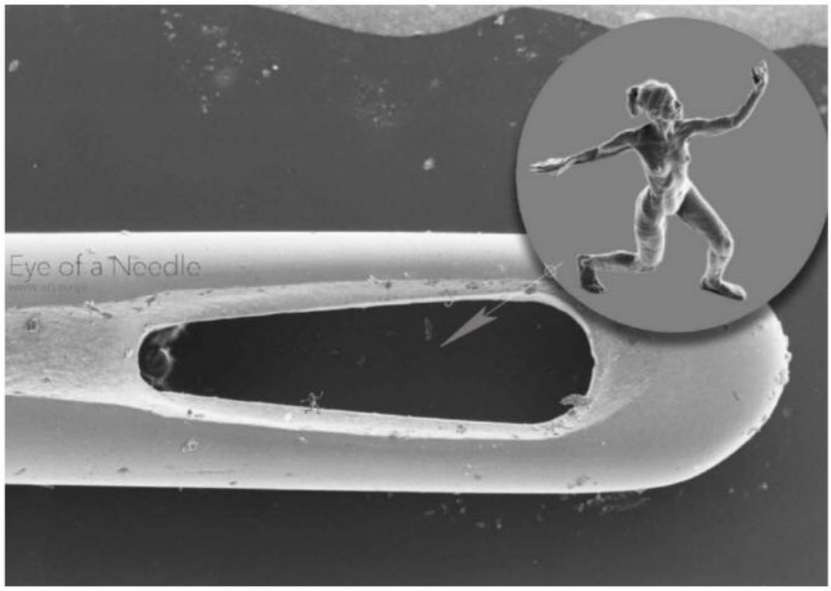
Designing detailed 3D sculpts for such a miniscule size was no easy feat, and the process required the use of ten different software packages including ZBrush, Cinema 4D and MeshLab. "To capture the model, I used this technology called photogrammetry," Hurwitz remembers, "but everyone in this industry knows that it's very imprecise." By using photogrammetry, Hurwitz was able to scan a real female model to start from, but the results were too fuzzy.

ZBrush and Cinema 4D were the solution, used to resculpt what the team had gotten into the resulting pieces of work. This wasn't the only design challenge the team had to face, though. Making sure all seven sculpts would then be able to print correctly with the Karlsruhe Institute's nanoscale 3D printer involved delicate work. "You have to consider the polygon density," continues Hurwitz. "We had to experiment with various mesh densities and look at where you put the higher polygon counts."

Though tiny, like any other 3D print the nanosculptures were also affected by gravity, and needed support structures to hold up any parts – like the arms or legs – that were outstretched. Just like that, nanoscaffolding was born.

Tragically, these final images are probably the last we'll ever see of the first ever set of Hurwitz's prints. Soon after, they were lost by an accidental touch under the electron microscope, leaving a fingerprint where the row of seven sculpts had been. Hurwitz, however, wasn't left discouraged for long. Today, he and the team have just finished work on a new set of sculptures aimed to improve on the issues encountered the first time round. The scaffolding has been upgraded by taking into account the centre of gravity, and the polygon density is higher to get more detailed final prints.

"In a way I feel like there's a responsibility for me as an artist to use all the contemporary tools that are available to me," Hurwitz explains. Now his work is showing the world just what nanotechnology can be capable of.



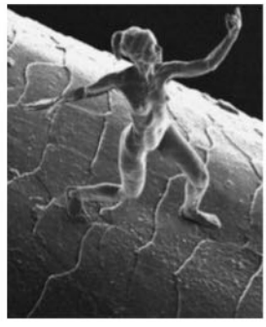

## The tech behind nanoprinting

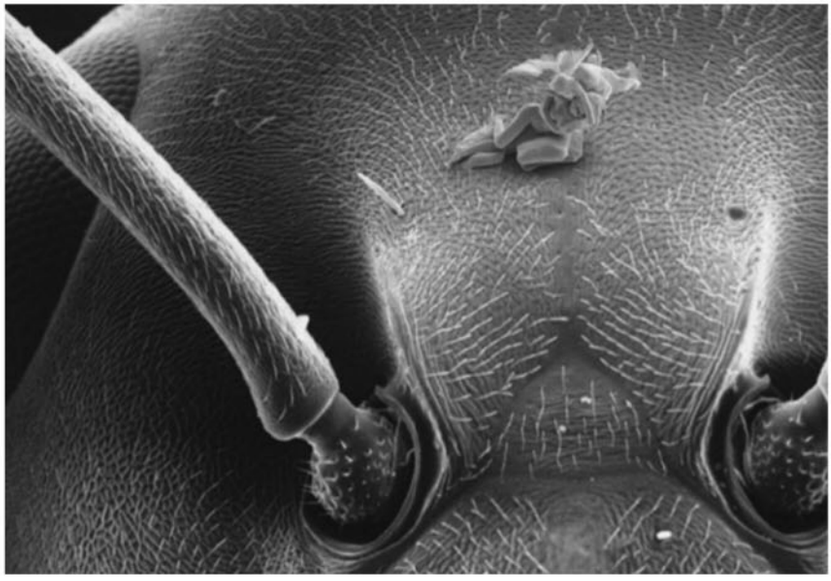
"The piece is created voxel by voxel. You start with the entire volume of resin already in place," Hurwitz begins. "To put it in more understandable terms, you put a blob of this special resin onto a very specialised highly polished piece of glass, and as seen from the photos this is all done in a sterile environment."

"Then when it goes into the machine, what happens is this laser fires into the resin and creates enough energy to solidify your first voxel.

"Then what happens is the laser doesn't move, the platform moves on one voxel, and fires the laser off again. So this little solid thing gets created within this blob of resin. We thought 'This is what the machine is capable of, let's push it to the extreme.'"

**ALL IMAGES** The electron microscope gave out a very precise measurement of the final prints, and it enabled Hurwitz to then composite elements like the needle, ant, and human hair from other microscopes to give an accurate sense of scale to his images

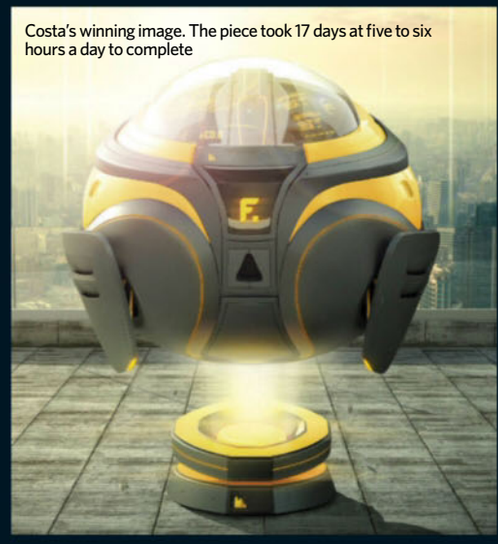




"With all of my work I try and push the boundaries. I try to push the limits of society"

**Jonty Hurwitz**, artist and entrepreneur

Costa's winning image. The piece took 17 days at five to six hours a day to complete



# Rafael Costa

## We speak to The Foundry's Time Travel Challenge winner about his Time Machine design

**What were the challenges of creating your design for Time Machine?**

Soon after the briefing, I had already put in my head that the time machine should be real: a clean model with characteristics of an actual product, comfortable for travelling, portable and sustainable. I tried to illustrate all of this in my conceptual sketches to show the functionality of this machine.

As for the design, I looked for references from concept artists and product design related to mechanics, robotics and machines with sci-fi themes.

**How did you use MODO 801 to create the piece? What were the main tools and workflows you found most successful?**

The pipeline basically divided into: modelling, product lighting, textures and rendering. After the creation of the machine, I thought about how you would sell the product in a propaganda ad.

First I blocked the model in its correct proportions, since I had just sketches, not a technical drawing or blueprint. After setting the proportion and basic geometry, I began to create the basic parts of the machine, such as the wings, propeller and protective cover. Modelling in MODO is something incredible, you have many options to control the 3D mesh. I used the symmetry a lot, along with the Loops, Sculpt tools, and Deformers – it was amazing!

**If you could advise other artists hoping to create their own piece of future technology, what would you say?**

I'm no expert in technology or anything related to sci-fi, but I am curious and love 3D! Whatever the subject, I feel prepared because I seek information, references, and the main thing, I analyse the briefing to create a concept that meets the need of work.

CELSIUS C740 will be revolutionising rack workstations with 18 CPU cores

# Fujitsu announces CELSIUS C740

## The company's new foray into the rack workstation market is set to be perfect for CG

World-renowned IT corporation Fujitsu is to release a successor to its CELSIUS C620 rack-mounted workstation, the CELSIUS C740. Offering support for 18 CPU cores, M2 solid state drives, 256GB of memory, SATA DOM solutions and a host of graphics options, the C740 promises to be a strong contender in the rack workstation market and it also promises to be a viable option for CG apps.

### Rack workstations for the future

"When talking about the rack workstation market, we have to say it is still kind of a niche market," said Fujitsu.

"What we see out of the market figures from IDC... is that the CELSUS C620 was growing in 2014 above the market growth for rack and blade workstations," continued Fujitsu. "We have had much success, especially in the automotive and mechanical engineering segments, among others."

"With the C620 we had some successes but, on the other side, we were closely listening to our customers and they told us what they want even more from a product like this," said Fujitsu. "This brought us to improving the platform. The C620 was based on a Xeon E3 platform, which was perfect in remote CAD scenarios, but with 32GB of memory there's not much headroom for large models that you want to design or [much scope to] use the machine with more than one user. So that was one of the potential improvements for a successor product that we noted from our customers."

"In the CELSIUS C740 we have the opportunity of using up to 18 cores in the CPU, [and this means that] you can very easily distribute these cores to different users," the company revealed.

As well as CPU improvements that look set to increase productivity and viability in the modern CG world, other features such as improvements in storage media have also been added.

For more information, please visit fujitsu.com/fts/products/computing/pc/workstations.

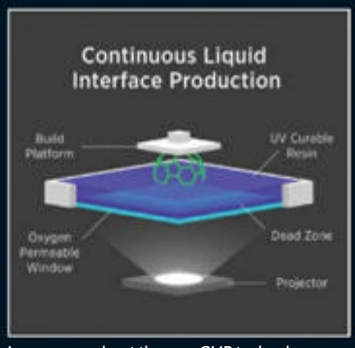
# Conventional 3D printing could change

## Carbon3D introduces a breakthrough layerless 3D printing method

First showcased to the world on the main stage at the 2015 TED conference, Carbon3D has just revealed an innovative new approach to 3D printing that could change the industry forever. Called Continuous Liquid Interface Production, or CLIP, the new technology harnesses light and oxygen to continuously grow complex objects from a pool of resin, instead of the usual process of printing these objects out slowly layer-by-layer.

This means that objects can now be created in just a few minutes instead of taking hours or days. This process means that CLIP works 25 to 100 times faster than conventional 3D printing results. The new method will even produce stronger objects with consistent mechanical properties, as they don't have to depend on the direction of the layers that the parts were first printed in.

"Current 3D printing technology has failed to deliver on its promise to revolutionise manufacturing," explained Dr Joseph DeSimone, who is CEO and cofounder of Carbon3D. "Our CLIP technology offers the game-changing speed, consistent mechanical properties and choice of materials required for complex commercial quality parts."




Learn more about the new CLIP technology **carbon3d.com**

**HAVE YOU HEARD?** MAXON, the creator of Cinema 4D, has just opened a new Canadian office in Montreal

# CG Cookie gives back

**Community site ambassadors have been visiting local schools to give workshops and portfolio critiques**

"We have over 200,000 users viewing our tutorials around the world, so it's easy to lose sight of what is happening in your own backyard," said Wes Burke, founder and CEO of CG Cookie. "We started the initiative of visiting local schools and libraries in 2014 with the goal to keep in touch with our community and support aspiring artists in the Chicago area."

In schools such as Marwen Art Center, a nonprofit institute providing visual art courses for under-served youth, the team has found Blender a natural tool to learn as it is free and easily available. Mirroring the new free Blender Basics introductory course on cgcookie.com, CG Cookie ambassadors gave hands-on workshops to the students.

Complete beginners were able to create their very first model complete for 3D printing all in one afternoon, getting the students excited about the industry and the future.

The CG Cookie team with students at The Illinois Art Institute. In the future the team hope to open the doors and offer free workshops to local students directly at their studio

Non-Commercial RenderMan is now available for Maya 2013.5, 2014, and 2015, and versions 1.5, 1.6, and 2.0 of The Foundry's KATANA

# Free RenderMan released

**Pixar's infamous rendering software is now available free for noncommercial use**

After first announcing the news earlier last year, Pixar Animation Studios has now released its Academy Award-winning RenderMan software completely free for noncommercial use. Anyone can now have access to the same software that went into making films such as *Guardians Of The Galaxy* for research, education, evaluation, plugin development, or any personal projects – all without a watermark, time limits, or feature limitations.

"The latest release of RenderMan is a technological reinvention. It's the result of focused research and development at both Pixar and Disney, and these advancements are now freely available to the visual effects and animation community." said Dr Ed Catmull, president of Pixar and Walt Disney Animation Studios, and also one of the founders of the original RenderMan architecture.

In conjunction with the release, Pixar has also launched a new community site where users can exchange knowledge and resources, showcase their own work, share assets such as shaders and scripts, and learn about RenderMan in tutorials.

Download your copy at renderman.pixar.com/view/non-commercial-renderman.

# VFX students aid Anthony Nolan and Dyslexia Action

**This year's BFX competition introduces a new twist to help charities in need**

An important part of the BFX festival every year is Bournemouth University's BFX competition, which sees groups of students from around the country compete against one another and create short animations in just a matter of weeks over the summer.

This year, charities were allowed to apply to be the subject of the animations for the very first time through Kingston Smith's Creative Vision Award. The winners, Anthony Nolan and Dyslexia Action, will be the recipients of the winning animations. The winning teams, and their animations, will be announced during the BFX Festival, which takes place from Monday 28 September to Sunday 4 October 2015 at the Bournemouth International Centre. Learn more about the festival at **bfxfestival.com**.

All the students will be mentored by industry experts while they create their films. Production houses involved include The Mill, Realise Studios and Blue Zoo

# Software shorts

Bringing you the lowdown on product updates and launches

### iClone 6

Reallusion has now launched iClone 6, a new iteration of its 3D animation software that has been three years in the making. The new release features refined 3D scene and character animation tools, new realistic rendering options and an editing environment. iClone 6 is now available at **reallusion.com/store/purchase_ic.aspx** from £79.99.

### mOculus.io

The new mOculus.io plugin enables Maya artists to see their work in VR for the first time by working with the Oculus Rift – something very handy for artists creating work for VR to test. The plugin also records the user's head for realistic camera animation to navigate the scene. To see more and download the plugin visit **moculus.io**.

### Canvas

Fabric Software, the company behind Fabric Engine, has announced the launch of Canvas, its highly anticipated new visual programming system. Canvas brings all the performance, flexibility and extensibility of Fabric, but has been made easier and more fun for developers to use. Learn more about Canvas at **fabricengine.com/canvas**.

**DID YOU KNOW?** Disney has announced that Frozen 2 is on its way with directors Chris Buck and Jennifer Lee set to return

# Animatrik Film Design

## Animatrik populates a war zone with mo-cap and digital doubles for American Sniper

**Description** Animatrik provides a full-body performance capture service for the film, television, commercials and gaming industries

**Website** animatrik.com

**Location** Canada

**Software** Maya, MotionBuilder, Faceware

**Contributors** Brett Ineson (CEO), Bruno Sargeant (director of business development)

**Portfolio Highlights**

**2015** *Chappie*
**2014** *American Sniper*
**2014** *NBA 2K15*
**2013** *Warm Bodies*
**2013** *Elysium*
**2013** *Batman Arkham Origins*
**2013** *Dead Rising 3*
**2013** *Splinter Cell: Blacklist*
**2010** *Twilight: Eclipse*
**2009** *District 9*

*American Sniper* images © Warner Brothers Pictures

Since its release in December 2014, Clint Eastwood's movie *American Sniper* has become a huge success, showered with commercial glory and critical approval. Established in 2001, Animatrik has provided mo-cap data for movies, TV, commercials and computer games, and *American Sniper* has put the company all the more on the VFX community's map.

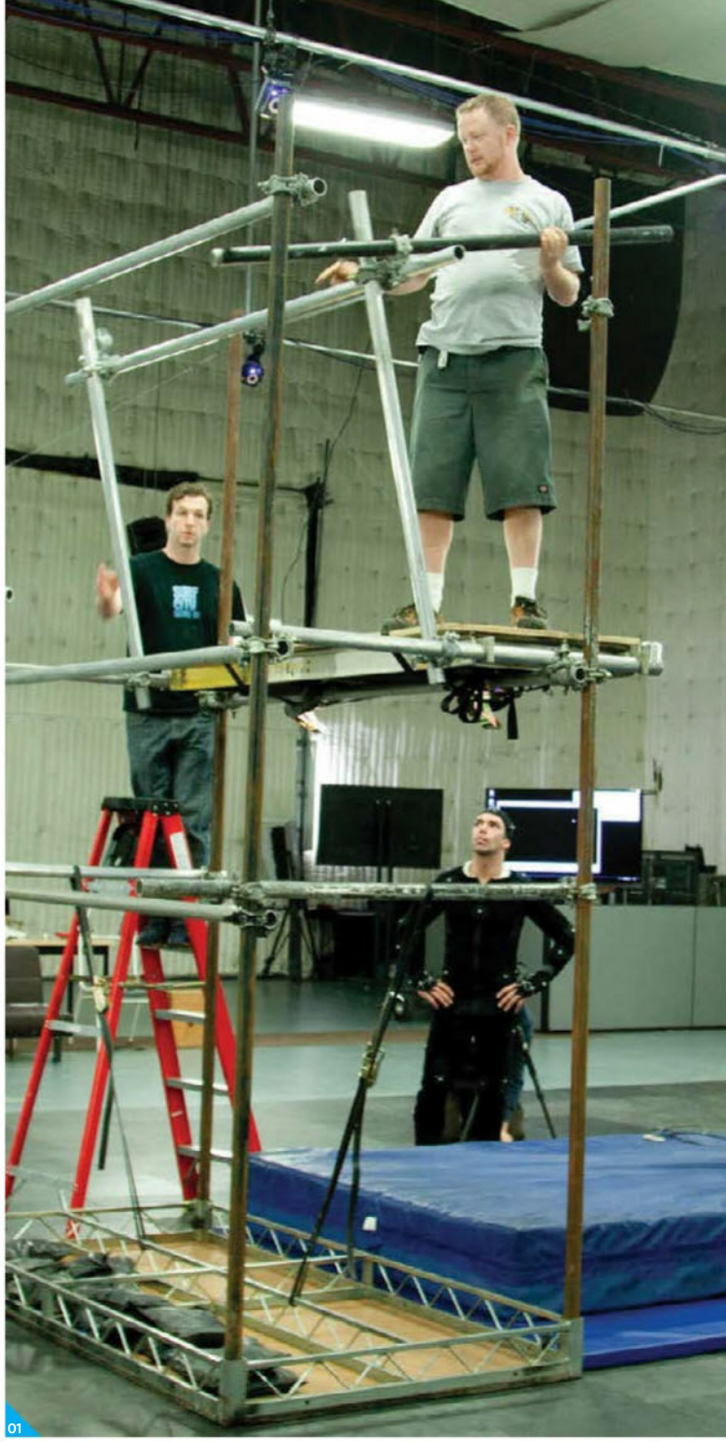
The work Animatrik undertook for *American Sniper* contributed to the re-creation of a number of battles and skirmishes. Operating-base scenes shot in Morocco for the film were filled with digital doubles integrated into the action by MPC, which worked with the mo-cap data that was generated at Animatrik's studios.

Brett Ineson, CEO of Animatrik Film Design Inc, explains the world of Animatrik: "We are a mo-cap and virtual production studio, offering mo-cap and virtual camera services. We specialise in hi-fidelity, digital-double solving methodologies. On *American Sniper* we needed digitally rendered characters." For the project, Animatrik were part of a creative pipeline for which they generated material to then be made available to the visual effects house, MPC. Animatrik's work on *American Sniper* combined capturing shot-specific and generic data to be made available to MPC.

"We worked with MPC and we were on the [postproduction] side of things," Brett says, "and the work we did was capturing the insurgent and army ranger characters as digital doubles: lots of shooting and jumping and populating the background of a variety of shots. We did over 200 takes of three actors; so that's 600 potential digital actor moves. We would have five or six people on stage and then ten or 12 working on behind the scenes." The process took just a few days of capture work and Bruno Sargeant, director of business development, makes the point that "MPC was very efficient" in liaising with Animatrik.

In February 2015, Animatrik announced that it will use Faceware software for its face-tracking work. This will go alongside the services that Animatrik provides, which include character set-up, virtual-set integration and scene assembly. For Brett and Bruno the future of motion capture is certainly looking promising. Of the studio's evolution, Bruno comments that one huge appeal for producers is that "mo-cap can be taken out on location". He explains that this, when coupled with Animatrik's efficient real-time visualisation system, has "flipped a switch" on demand.

Mo-cap's development and application has been evolving fast for just about 20 years now, but it's really been the last five or six years that have foregrounded the technology's creative use. Bruno thinks that the future of mo-cap is looking increasingly viable for film-makers. "Booking mo-cap is becoming no different to booking lighting and crew," he says. "VFX used to book mo-cap and now production book us and put us in the production budget and not the VFX budget. People might have wanted mo-cap and believed it wasn't suitable [before], and now they feel it doesn't matter where they shoot."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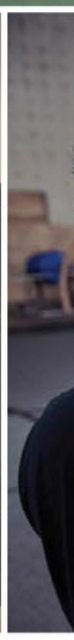

“Our stage is equipped with a Vicon system and is one of the largest mo-cap stages in North America”
Bruno Sargeant, director of business development

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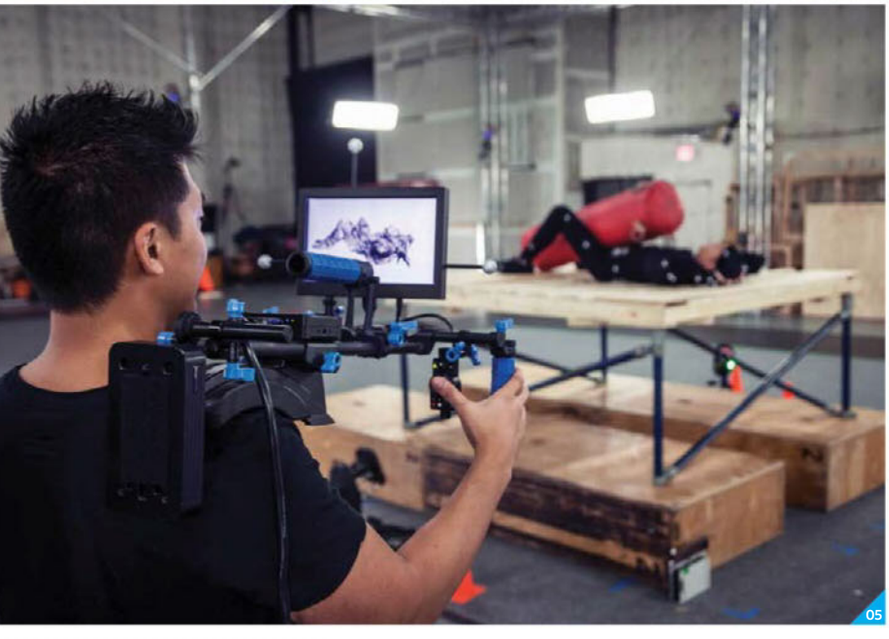

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# The facilities

**Animatrik has built some of the largest studio stages in North America for motion capture**

Animatrik Film Design’s mo-cap studio facilities are based in Vancouver, Los Angeles and Toronto – the east-Canadian city proving hugely useful and efficient for the company to easily connect with New York production opportunities. The Vancouver studo base is an impressive 15,000 square foot purpose-built soundstage. Bruno notes of the hardware resource that Animatrik’s stage is “equipped with a Vicon system and is one of the largest motion capture stages in North America.” Animatrik’s Vicon system comprises 56 cameras to capture raw mo-cap data.

**01** Animatrik prepares staging to capture stuntmo-cap data

**02** Animatrik’s green screen, mo-cap soundstage is one of the largest in the world

**03** Animatrik-generated mo-cap data to be used for combat scenes throughout the film

**04** Animatrik offers real-time digital character interaction on the mo-cap stage

**05** Animatrik’s virtual camera and facial mo-cap rig in action

**Job** FX developer

**Website** jaideepkhadilkar.blogspot.in

**Location** India

**Biography** Jaideep Arun Khadilkar is from Mumbai, India. After completing his Bachelor of Engineering in Computer Science, he started working in CG. His journey began with postproduction for TV commercials. He then worked in VFX for movies before moving on to animated movies. Although he is passionate about CG, Jaideep also enjoys experimenting with human-computer interfaces. He also enjoys juggling, magic and solving puzzles in his spare time.

**Portfolio Highlights**
**2014** *Penguins Of Madagascar*
**2014** *How to Train Your Dragon 2*
**2011** *Ra.One*
**2009** *What's Your Rashee?*
**2009** *Kurbaan*
**2009** *De Dana Dan*

*Penguins Of Madagascar* images © 2014 DreamWorks Animation LLC. All Rights Reserved.

*How To Train Your Dragon 2* image © 2014 DreamWorks Animation LLC. All Rights Reserved.

# Jaideep Arun Khadilkar

FX developer

## We meet DreamWorks artist Jaideep Khadilkar and discuss the complex world of FX development

If you want to see how impressive the world of FX development is today, just check out Jaideep Khadilkar's latest showreel (tinyurl.com/3DAJaideep). You'll see splintering wood, stunning water effects, and blobs of thick, bubbling jelly. We met with the DreamWorks FX developer to discuss just how challenging FX is – a discipline where art and technology are more closely intertwined than anywhere else.

**What advice would you give to others looking to start a career in FX development?**
One needs to have a combination of creative and technical skills. FX artists focus more on the creative skills, while FX developers more on the technical skills. Some of the basic technical skills required are mathematics, physics, programming and a basic knowledge of simulations. Creative skills include things like the 12 principles of animation, colour theory and composition.

An FX artist should always understand how forces or materials give shape, scale, colour and motion. Along with these skills, time management is necessary.

**What are some complex techniques you've created?**
The movie *Ra.One* features two superhumans, requiring entire suits to be created in CG. There were around 800 shots of suit replacement. I led a Houdini team of ten artists, and worked on planning and designing the entire Houdini suit pipeline. This consisted of: file naming conventions, folder structure hierarchy, automated creation of Houdini digital assets for various 3D attachments to the suit, a master Houdini template file for shading and lighting, scripts or shelf tools for lighting, and process checklists for lighting and rendering.

**What would you say are the most difficult FX to create?**
The difficulty of any effect depends on various factors. Scale is one of them. For example, a huge-scale destruction shot will only look believable if it has various-sized chunks, layers of debris and dust – not to mention the interaction between them.

Also, physical simulations are computationally expensive, and they are difficult to art direct. Therefore they need many iterations to get to the right level to look good in the shot.

Finally, creating effects for stereoscopic 3D has been more of a recent challenge.

**What is it like to work with DreamWorks Animation?**
Working with DreamWorks Animation and DreamWorks Dedicated Unit gives me a sense of pride. I have found that all artists here are valued for their creativity and talent. The studio fosters your creativity and creates a culture to generate engagement, collaboration and transparency. Irrespective of the job responsibilities and designation, we all are encouraged to contribute ideas.

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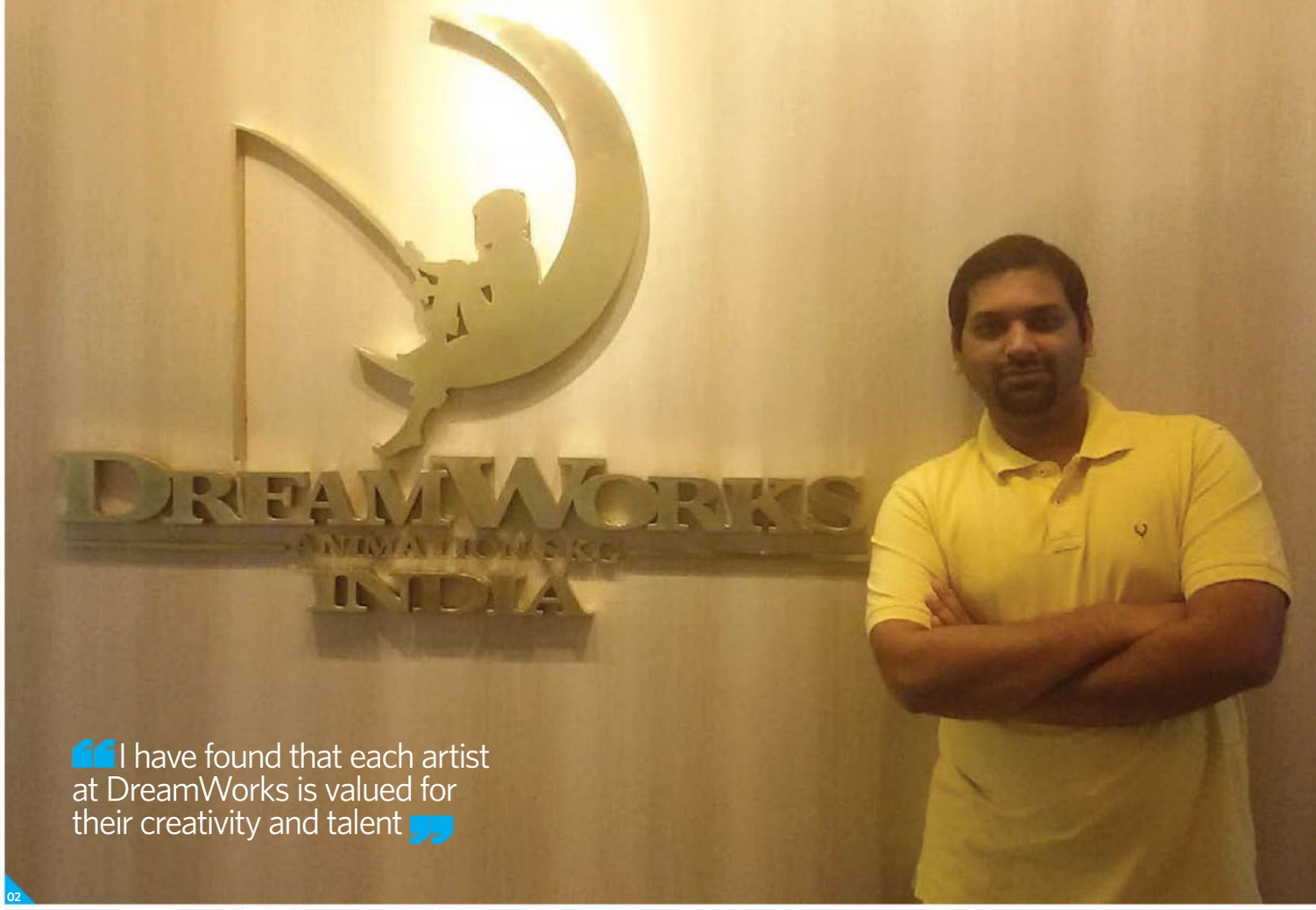


"I have found that each artist at DreamWorks is valued for their creativity and talent"

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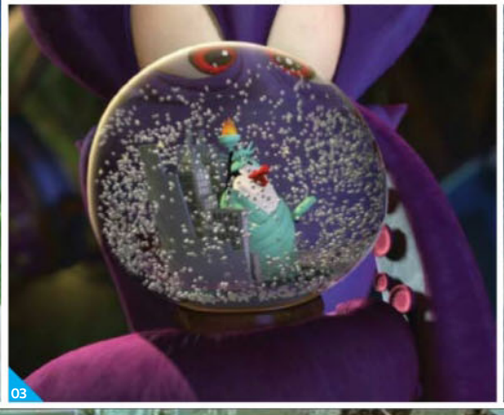

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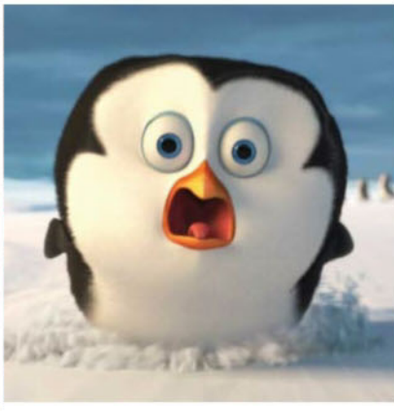

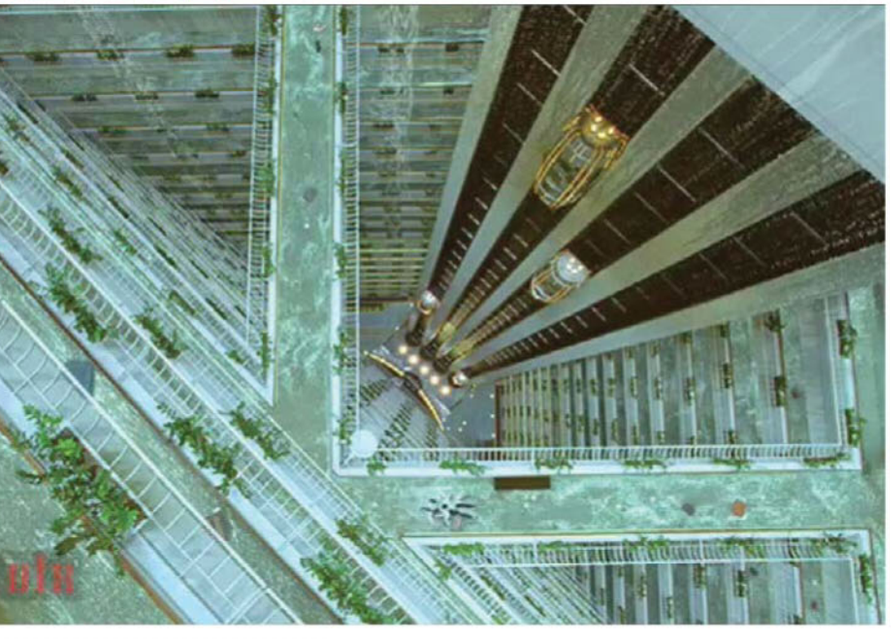

## Future FX

### Jaideep discusses the changes he expects to see affecting the world of FX in the coming years

"The current trends in the FX world show rapid changes in simulation techniques. Third-party libraries, such as Bullet, are now being integrated into standard tools.

"A considerable amount of simulation and rendering work will also be delegated to GPU in the near future. I also think that many studios may start to consider using open source tools like Blender.

"Finally, many studios currently have their proprietary toolsets and pipeline. But outsourcing and collaboration is increasing. There is a strong need to standardise pipeline tools. I believe we will see this more in the coming years."

**01** Jaideep chose to specialise in FX development when he realised that his knowledge of maths and programming, along with computer graphics, was a great combination

**02** In the future, Jaideep believes that FX heavy films with a large simulation requirement will be rendered using offsite services

**03** Jaideep's older brother used to experiment with RenderMan, which first prompted his interest in FX. This interest grew into passion following viewings of films like *Titanic*

**04** Jaideep name checks Maya and Blender as being great for FX creation, but personally prefers Houdini for the power that its procedural workflow offers over the final effect

**05** FX developers need to have a technical mind that can grasp complex topics like Python programming with a flair for creative areas like composition

01

# Images of the month

**These are the 3D projects that have been awarded 'Image of the week' on 3DArtistOnline.com in the last month**

**01** White Living Room
**by Simone Manna**
3DA username **Nexzac**
**Simone says:** "I created this scene (inspired by a real photo) as an exercise between one job and another, trying to improve the photorealism of my images. I used Cinema 4D, V-Ray and Photoshop."
**We say:** *There's a real atmosphere of calm and some excellent, technical arch-vis work. We particularly like the lighting and the way it reflects off of the painted floorboards.*

**02** Planted Tank
**by Mustafa Öner**
3DA username **Mozoner**
**Mustafa says:** "This is my personal project. I always like aquarium architecture, especially planted freshwater tank design, so I really enjoyed working on this image. I used 3ds Max, V-Ray, Photoshop to create the scene."
**We say:** *We think that Mustafa's underwater scene is excellent, both in its technicality and its excellent composition. A really great scene.*

**03** Auto Chopper
**by Lee Souder**
3DA username **Lee Souder**
**Lee says:** "The guts of this Auto Chopper came from previous mech models. The shell was then modelled in Maya, which tied the whole drone together. Rendered in Maya with mental ray."
**We say:** *We love the blur effect that Lee has created around the rotors, giving the model a tangible sense of movement. The hints of wear and tear on the body are a fantastic touch.*

**04** Plymouth 1971 Cuda 426 Hemi
**by Humam Munir**
3DA username **humam**
**Humam says:** "I really like classic cars. This image was made with 3ds Max and V-Ray with compositing done in Photoshop."
**We say:** *Judging by the bullet holes in the window, the driver of this car may have met a sticky end. Still, the car itself is a great example of hard-surface modelling and looks particularly lifelike.*

02

Image of the month

03

04

## Orc Warrior
**by Damian Jara**
**3DA username damian85osg**
**Damian says:** "This personal piece is the third project I have completed in ZBrush overall, and I used it to learn the software better. I began by searching for references and ideas on internet sites like Pinterest and Google."
**We say:** *This is an excellent fantasy sculpt from Damian, neatly combining hard surface and organic design ideas. It's nice to see him adapt the traditional T-pose in order to create a more dynamic pose, without actually having to adjust the character too much.*

## Shells **by Tomi Väisänen**
**3DA username Tomivaisanen**
**Tomi says:** "What started as a V-Ray material test ended up being a full image. I modelled one shell, then scattered them around with MassFX physics. There's one directional light and an HDRI for reflections."
**We say:** *This image is so different from most submissions we receive and really stood out. The scattering looks extremely real and the lighting is spot on.*

## Anatomy WIP **by Bradford Morgan Gibson**
**3DA username scratchdaddy**
**Brad says:** "The left side was done as a rough sculpt using the Clay Tubes and Dam_Standard brushes only. For the right side I created an IMM brush from Ryan Kingslien's anatomy tool that ships with ZBrush."
**We say:** *Brad's study in anatomy is an interesting concept and demonstrates a clear understanding of how the skeleton and skin relate to each other.*

## Kiosko **by Nitesh Nagda & Alex Martin**
**3DA username nitrxo721 & Khaldanis**
**Nitesh & Alex say:** "Our inspiration came from a concept by Alejandro Burdisio. Working as a group has let us hone our skills as artists in ways that working alone would not have and we're very proud of the work we have done."
**We say:** *This flying building has a real* Up *feel to it and we especially like the flashes of blue flame and the rusting fuel tanks. The guys have done a wonderful job of combining sci-fi with more traditional, yet cartoon-like, arch-vis creation.*

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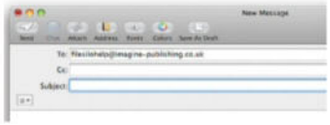

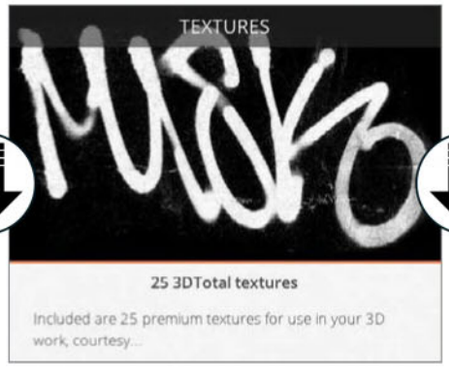

# NEED HELP WITH THE TUTORIALS?

Having trouble with any of the techniques in this issue's tutorials? Don't know how to make the best use of your free resources? Want to have your work critiqued by those in the know? Then why not visit the **3D Artist** Facebook page for all your questions, concerns and qualms? There is a friendly community of fellow 3D artists to help you out, as well as regular posts and updates from the magazine team. Like us today and start chatting!

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